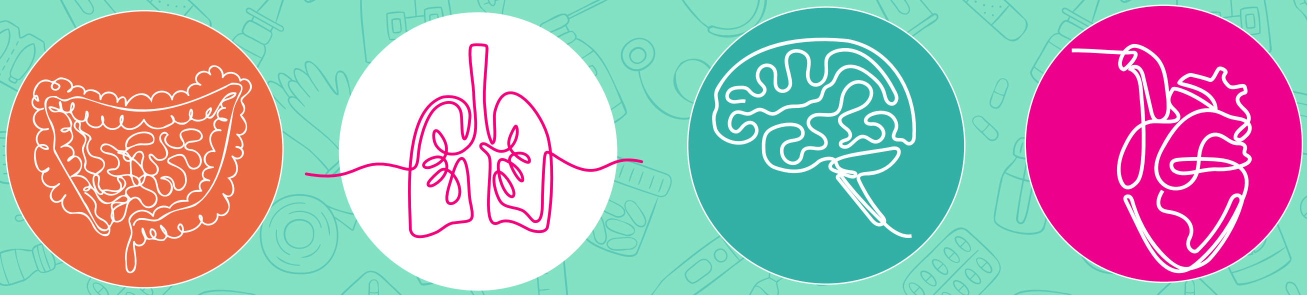
# NURSING SCHOOL

## SUCCESS BUNDLE



BROUGHT TO YOU BY Nurse Well Versed™

### TO MY NURSING SCHOOL FRIEND:

# YOU GOT THIS!

These notes were created to make the plethora of information you learn in nursing school simpler, easier to understand, and minus all of the fluff. I remember so vividly how stressed and overwhelmed I felt in nursing school before I learned how and what to study. I went from failing nursing school to acing my NCLEX and going on to become an ICU nurse. I've taught and mentored multiple new nurses and nursing students along the way and if it's taught me anything it's that there's **always** a simpler (and more efficient) way. Believe me when I say if I was able to do it, YOU can do it too.

♥ Allorah Foote, BSN, RN, CCRN

## LET'S CONNECT!

Follow me on social media for study tips, product updates, and breakdowns of commonly tested nursing school topics!

@NURSEWELLVERSED

## LOVE YOUR ORDER?

It would mean the world to me if you left a review! Thank you so much for supporting my small business and I'm so grateful to be able to serve you along your nursing journey!

**Published by Active Creators LLC**

**This product is STRICTLY FOR PERSONAL USE ONLY and may not be shared, reproduced, redistributed, or transmitted in any form or by any means. Any attempts to illegally copy or redistribute any products from Nurse Well Versed is in violation of copyright infringement and violators will be prosecuted to the full extent of the law.**

The information in Nurse Well Versed products is for educational purposes only and is not intended for use as medical advice or clinical practice. Consult a healthcare professional before making health decisions. Values and data may differ between nursing programs. Use this book as supplemental information only and prioritize course material from your nursing program. The author disclaims all warranties and assumes no liability for damages resulting from the use or inability to use this book's content.

# TABLE OF CONTENTS

FUNDAMENTALS....5

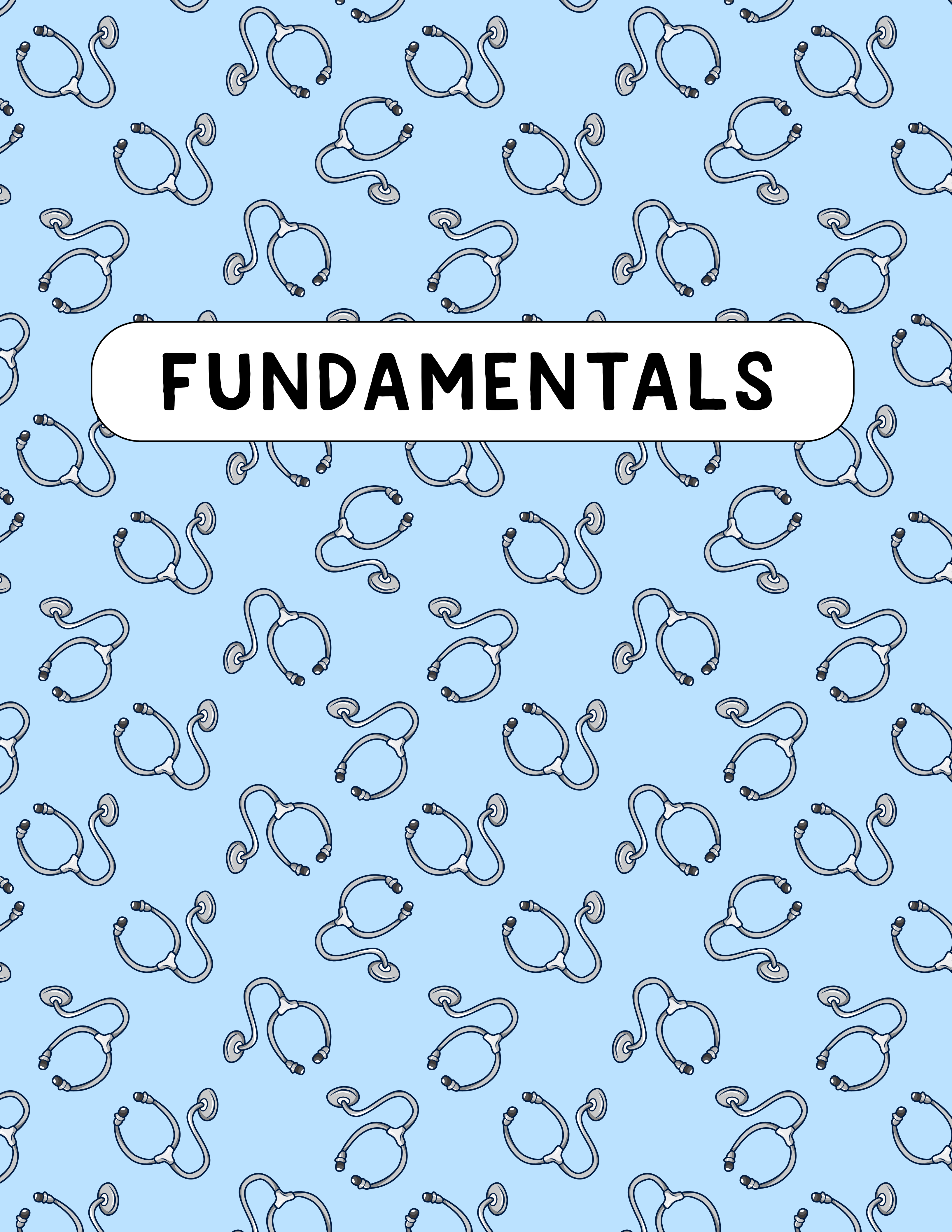
MED SURG

Neuro....49
Respiratory....70
Cardiac....86
Musculoskeletal....104
Gastrointestinal....114
Renal/Urinary....127
Endocrine....139
Hematology....150
Immune....158
Critical Care....171

MENTAL HEALTH....186
MOTHER BABY....203
PEDIATRICS....227
PHARMACOLOGY....260

TEMPLATES & PLANNERS....290

# FUNDAMENTALS



# MEDICAL TERMS & ABBREVIATIONS

## ASSESSMENT TERMS

**AAO:** awake, alert, oriented
**AKA:** above-knee amputation
**AMS:** altered mental status
**BKA:** below-knee amputation
**BM:** bowel movement
**BP:** blood pressure
**BPM:** beats per minute
**BS:** bowel sounds
**CVC:** central venous catheter
**I&O:** intake and output
**JVD:** jugular venous distention
**LBW:** low birth weight
**LMP:** last menstrual period
**LOC:** level of consciousness
**MAP:** mean arterial pressure
**NKDA:** no known drug allergies
**NPO:** nothing by mouth
**NVD:** nausea, vomiting, diarrhea
**OOB:** out of bed
**SOB:** shortness of breath
**VSS:** vital signs stable
**WNL:** within normal limits

## DRUG PREP

**CAP:** capsule
**DR:** delayed release
**EC:** enteric coated
**SR:** sustained release
**ELIX:** elixir
**SUPP:** suppository
**SUSP:** suspension
**TAB:** tablet

## MEDICATION ROUTES

**GT:** gastrostomy tube
**ID:** intradermal
**IM:** intramuscular
**IV:** intravenous
**IVP:** intravenous push
**IVPB:** intravenous piggyback
**NG:** nasogastric
**OD:** right eye
**OG:** orogastric
**OS:** left eye
**OU:** both eyes
**PO:** by mouth
**PR:** per rectum
**SL:** sublingual
**SUBQ:** subcutaneous

## LOCATION

**ABD:** abdomen
**ETT:** endotracheal tube
**FA:** forearm
**LE:** lower extremity
**LLE:** left lower extremity
**LLL:** left lower lobe
**LLQ:** left lower quadrant
**LUE:** left upper extremity
**LUL:** left upper lobe
**LUQ:** left upper quadrant
**RLE:** right lower extremity
**RLL:** right lower lobe
**RLQ:** right lower quadrant
**RUE:** right upper extremity
**RUL:** right upper lobe
**RUQ:** right upper quadrant
**UE:** upper extremity

## DIAGNOSTIC TESTS

**BX:** biopsy
**CT:** computed tomography scan
**CXR:** chest x-ray
**DRE:** digital rectal exam
**ECHO:** echocardiogram
**EEG:** electroencephalogram
**EKG/ECG:** electrocardiogram
**KUB:** X-ray of kidneys, ureters, bladder
**MRI:** magnetic resonance imaging
**PET:** positron emission tomography
**PFT:** pulmonary function test
**US:** ultrasound
**VQ SCAN:** ventilation-perfusion scan

## MEDICATION TIMES

**AC:** before meals
**AD LIB:** as desired
**BID:** two times a day
**DAILY:** once a day
**HS:** at bedtime
**PC:** after meals
**PRN:** as needed
**Q1:** every hour
**Q2:** every 2 hours
**Q4:** every 4 hours
**Q:** every
**QH:** every hour
**QID:** four times a day
**TID:** three times a day

## BANNED ABBREVIATIONS

| DO NOT USE | POTENTIAL PROBLEM | INSTEAD USE |
|---|---|---|
| U | Mistaken for "0" or "cc" | unit |
| IU | Mistake for IV or "10" | international unit |
| Q.D., QD, q.d., qd, Q.O.D., QOD, q.o.d., qod | Mistaken for each other | daily or every other day |
| Trailing zero (X.0 mg) or lack of leading zero (.X mg) | Decimal point is missed | X mg, 0.X mg |
| MS, MS04, MgS04 | Can mean morphine sulfate or magnesium sulfate | morphine sulfate or magnesium sulfate |

## MEASUREMENTS

**DR:** dram
**G:** gram
**GAL:** gallon
**GTT:** drop
**KG:** kilogram
**L:** liter
**LBS:** pound
**MCG:** microgram
**MEQ:** milliequivalent
**MG:** milligram
**MIN:** minum
**ML:** milliliter
**OZ:** ounce
**PT:** pint
**QT:** quart
**T, TBS, TBSP:** tablespoon
**TSP:** teaspoon

## GENERAL TERMS

**ADL:** activities of daily living
**AMA:** against medical advice
**C/O:** complaint of
**CC:** chief complaint
**D/C:** discontinue/ discharge
**DNR:** do not resuscitate
**DOB:** date of birth
**DX:** diagnosis
**ETOH:** ethanol
**Fx:** fracture
**HOB:** head of bed
**HPI:** history of present illness
**Hx:** history
**I & D:** incision and drainage
**MVA:** motor vehicle accident
**OTC:** over the counter
**PCP:** primary care physician
**PMHx:** past medical history
**PSHx:** past surgical history
**PT:** patient
**R/T:** related to
**Rx:** prescription
**S/S:** signs and symptoms
**SBAR:** Situation, Background, Assessment, Recommendation
**STAT:** immediately
**Sx:** symptoms
**Tx:** treatment
**VS:** vital signs

## SUFFIXES

**–ECTOMY:** excision/ removal
**–ITIS:** inflammation of
**–(O)STOMY:** new opening
**–PHAGIA:** eating/ swallowing
**–POESIS:** formation

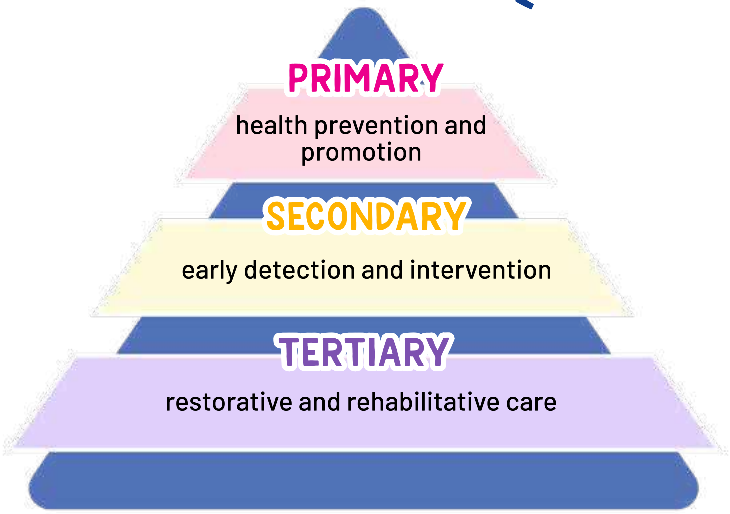
## PREFIXES

**ANTE–** : before
**AUTO–** : self
**BRADY–** : slow
**CEPHALO–** : head
**DYS–** : impaired
**EPI–** : above
**HEMA–** : blood
**HYPO–** : low
**HYPER–** : high
**MACRO–** : large
**MICRO–** : small
**PAN–** : all
**PERI–**: around
**POLY–** : many
**POST–** : after
**PRE–** : before
**SUB–** : below
**SUPRA–** : above

# HEALTHCARE DELIVERY SYSTEM

Mechanism for providing services that meet health-related needs of individuals
↳Nursing is a major component of the U.S healthcare delivery system

## LEVELS OF CARE



**PRIMARY**
health prevention and promotion

**SECONDARY**
early detection and intervention

**TERTIARY**
restorative and rehabilitative care

## REGULATORY ORGANIZATIONS

### THE JOINT COMMISSION

Sets quality and safety standards for healthcare facilities to receive and maintain accreditation

### OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION

Protects employees by setting requirements for employers to provide safe work conditions

### FOOD AND DRUG ADMINISTRATION

Protects public health by ensuring safety, efficacy, and security of drugs and food

### CENTERS FOR MEDICARE & MEDICAID SERVICES

Enforces health and safety guidelines that must be met in order for reimbursement for medical care

## HEALTHCARE TEAM

**PROVIDER (MD, PA, DO, NP)**
Assess, diagnose & treat disease or injury

**REGISTERED NURSE (RN)**
Implement the nursing process

**NURSING ASSISTANT (CNA, UAP)**
Help patients with ADL's and direct care needs under supervision of RN/ LPN

**OCCUPATIONAL THERAPIST (OT)**
Help patients regain skills for activities of daily living

**RESPIRATORY THERAPIST (RT)**
Evaluate, assess, and give treatments for respiratory issues under order of provider

**SOCIAL WORKER**
Collaborate with team and community resources to ensure patient's physical & emotional needs are met

**SPEECH PATHOLOGIST**
Assess and create treatment plans for patients involving speech, language, and swallowing

**PHARMACIST**
Provides, educates, and monitors medications

**LAB TECHNICIAN**
Obtains and analyzes patient specimens

## NURSE PRACTICE ACTS

**Laws that govern the scope of nursing practice in a state or territory**

→ Nurses cannot practice beyond limits stated

→ Sets minimal educational requirements and qualifications for licensure

→ Lists violations that can result in disciplinary action

# ETHICS & LAW

## ETHICS TERMS

**BENEFICENCE:** Do good

**NONMALEFICENCE:** Do no harm

**AUTONOMY:** The right to make own decisions

**VERACITY:** Tell the truth

**JUSTICE:** Distribute care equally & fairly

**FIDELITY:** Keep promises

**ADVOCACY:** Supporting patient's medical decisions

## PATIENT RIGHTS

**ALL PATIENTS HAVE THE RIGHT TO:**

- → Privacy & confidentiality
- → Respect & dignity
- → Select their own provider
- → Consent or refuse treatment
- → Being informed of medical condition & treatment
- → Obtain their own medical records
- → Make decisions about end-of-life care

## CONSENT

### INFORMED CONSENT

Written permission from patient for healthcare team to perform a procedure

- → Nurse serves as witness to consent
- → Ensure the consent is signed by appropriate person; patient, guardian, power of attorney
- → In a case where the patient is unable to make decisions and POA is not reachable, **emergency law takes over for implied consent**

## TYPES OF CONSENT

- → Surgeries
- → Receiving blood products
- → Anesthesia
- → Radiation & chemo
- → Some advanced medical tests, like biopsy
- → Most vaccines

## LEGAL TERMS

**NEGLIGENCE:** Failure to fulfill nursing responsibilities, putting patient at risk for harm

**MALPRACTICE:** Failure to perform duties that results in harm to patient

**ASSAULT:** Verbal or implied threats

**BATTERY:** Physical contact that causes injury

**FALSE IMPRISONMENT:** Restraining patient against will without justification or order

## HIPAA

**HEALTH INSURANCE PORTABILITY & ACCOUNTABILITY ACT**

Acts to protect a patient's **private health information**

- → Only access patient data pertinent to job
- → No sharing passwords or login info
- → Don't look up patients not in care
- → Don't leave patient data unattended where it may be viewed by others
- → Don't speak about patients in public

# THE NURSING PROCESS (ADPIE)

## 1 ASSESSMENT

**Gather information** through subjective and objective data

VERIFY ACCURACY OF GATHERED INFORMATION

### SUBJECTIVE DATA

Information collected from **subject**

EXAMPLES:
- Patient reporting 6/10 pain
- Family member telling you patient fell last week

### OBJECTIVE DATA

Information collected through **observation**

REMEMBER O FOR OBJECTIVE & OBSERVATION

EXAMPLES:
- Auscultating bowel sounds
- Vital signs

### TYPES OF ASSESSMENTS

**INITIAL/ BASELINE:** First time evaluating patient either for admission or during your initial encounter

**FOCUSED:** Assessment of only a focused area or areas relating to presenting problem

**EMERGENCY:** Assessing ABC's (airway, breathing, circulation) in emergency situations to assess for cause of presenting urgent problem

**ONGOING/ REASSESSMENT:** Reassessing patient after time or event has passed to compare to baseline assessment

## 2 DIAGNOSIS

**Identify a problem** to form a (NANDA approved) nursing diagnosis

No **ACTION** is taken at this step; only problems (nursing diagnoses) are identified

### ACTUAL

Identifying current **existing** problem

We identify the current problem so we can create a *plan of action* to treat it, such as repositioning the patient for comfort, pain medication, etc.

EXAMPLE:
Patient has 6/10 pain after coming back from abdominal surgery

VS.

### POTENTIAL

Identifying **potential problems** the patient is at risk for

We identify the potential risk so we can take action and implement *prophylactic measures*, such as early ambulation, DVT prophylaxis (heparin, lovenox, SCD's)

EXAMPLE:
Patient is at risk for developing DVT after surgery

## 3 PLANNING

Set **SMART** goals to solve the problem

**S PECIFIC (WHO AND WHAT?):** Clearly define the goal that is trying to be obtained

**M EASURABLE (BY HOW MUCH?):** Create milestones and achievements that are clearly measurable

**A CHIEVABLE (HOW?):** Make sure goals are attainable based on current situation, resources, and skills

**R ELEVANT (WHY?):** State why is this goal important & how does it benefit the overarching goals & values

**T IMELY (WHEN?):** Create time-bound objectives that set a reasonable time for goal to be achieved

## 4 IMPLEMENTATION

Put plan into action;
aka "**NURSING INTERVENTIONS**"

EXAMPLES:
- Placing SCD's on patient
- Giving medications
- Educating patient

## 5 EVALUATION

- Determine outcomes of goals
- Evaluate effectiveness, modify & assess for needed changes to plan

# INFECTION PREVENTION

## HOSPITAL-ASSOCIATED INFECTIONS

**CAUTI:** Catheter-Associated Urinary Tract Infection
**SSI:** Surgical Site Infection
**CLABSI:** Central Line Associated Bloodstream Infection
**VAP:** Ventilator Associated Pneumonia

#1 WAY TO PREVENT INFECTION:
HAND HYGIENE

## TYPES OF IMMUNITY

### INNATE IMMUNITY

- Immunity you are born with
- First line of defense

### ADAPTIVE (ACQUIRED) IMMUNITY

- Immunity after being exposed to diseases or getting vaccinations
- Second line of defense

## TYPES OF ADAPTIVE IMMUNITY

### ACTIVE NATURAL

Body produces antibodies in response to exposure to a live antigen

### ACTIVE ARTIFICIAL

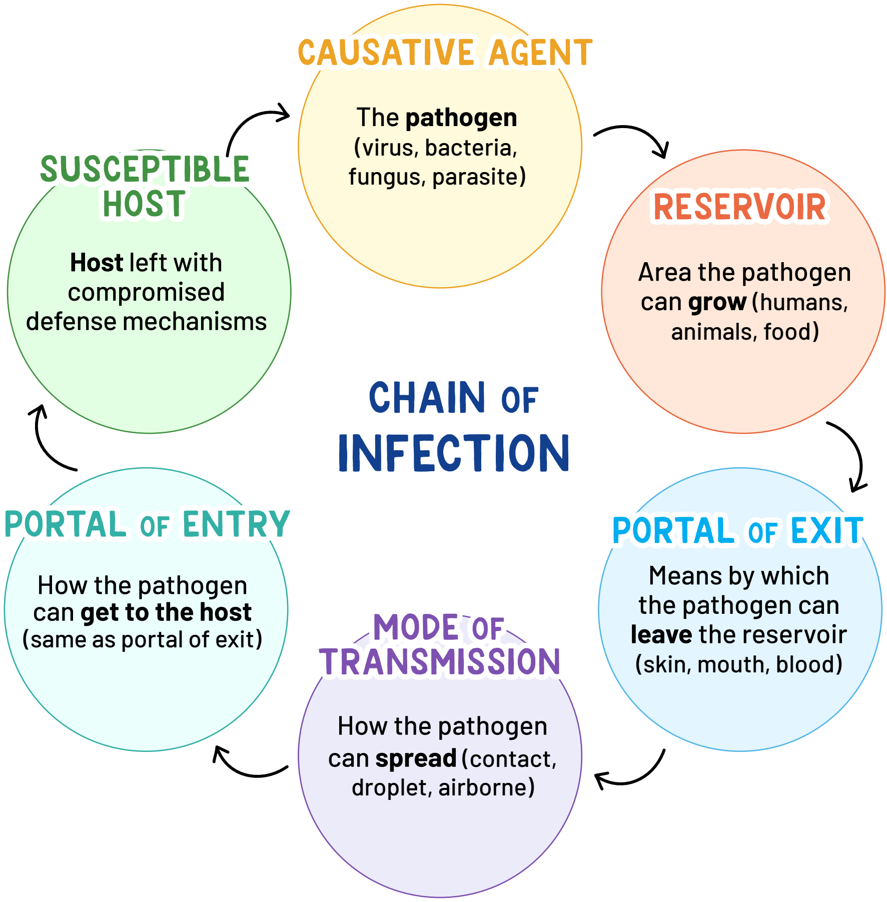
Body produces antibodies in response to a vaccine

### PASSIVE NATURAL

Antibodies passed from mother to baby through placenta or breast milk

### PASSIVE ARTIFICIAL

Immunoglobulins are administered after exposure to a pathogen



## CHAIN OF INFECTION

### CAUSATIVE AGENT

The **pathogen** (virus, bacteria, fungus, parasite)

### RESERVOIR

Area the pathogen can **grow** (humans, animals, food)

### PORTAL OF EXIT

Means by which the pathogen can **leave** the reservoir (skin, mouth, blood)

### MODE OF TRANSMISSION

How the pathogen can **spread** (contact, droplet, airborne)

### PORTAL OF ENTRY

How the pathogen can **get to the host** (same as portal of exit)

### SUSCEPTIBLE HOST

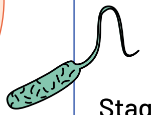
**Host** left with compromised defense mechanisms

## STAGES OF INFECTION

### INCUBATION PERIOD

Time between entry of infectious agent of host and onset of symptoms

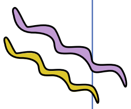
↓



### PRODROMAL STAGE

Stage person **most infectious**, vague and non-specific symptoms

↓



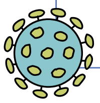
### ILLNESS STAGE

Presence of specific symptoms and signs of disease

↓

### CONVALESCENT STAGE

Recovery from infection



# INFECTION CONTROL

## TYPES OF PRECAUTIONS

★ **IN ALL PRECAUTIONS:** Strict hand hygiene, gloves & disposable equipment

**STANDARD:** Use gown, gloves, goggles, mask as needed per situation

### CONTACT

Pathogens spread through direct or indirect contact with patient or environment

- → Private room
- → Door can remain open
- → Gown, gloves

**REMEMBER "MRS.WEE"**

- **M** Multi-Drug Resistant Organism
- **R** Respiratory Infection
- **S** Skin Infections
- **W** Wound Infections
- **E** Enteric (C.Diff)
- **E** Eye Infection

When in contact with C.Diff you MUST use **soap and water**; bacteria is not killed with hand sanitizer!

### AIRBORNE

Pathogens passed through air transmission

- → Private **negative pressure** room
- → Door remains closed
- → N-95, goggles, gown, gloves

**THINK "GO ON THE AIR AT MTV"**

- **M** Measles
- **T** Tuberculosis
- **V** Varicella

DO NOT NEED AIRBORNE WHEN ALL LESIONS ARE CRUSTED OVER

### DROPLET

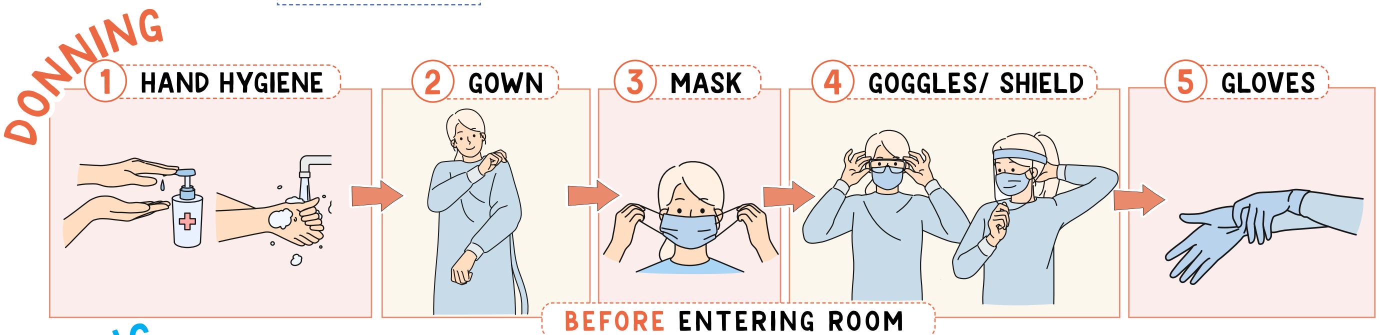
Pathogens passed through respiratory secretions

- → Private room
- → Door remains closed
- → Gown, gloves, mask, goggles

**REMEMBER "PIMP"**

- **P** Pertussis
- **I** Influenza
- **M** Meningitis
- **P** Pneumonia

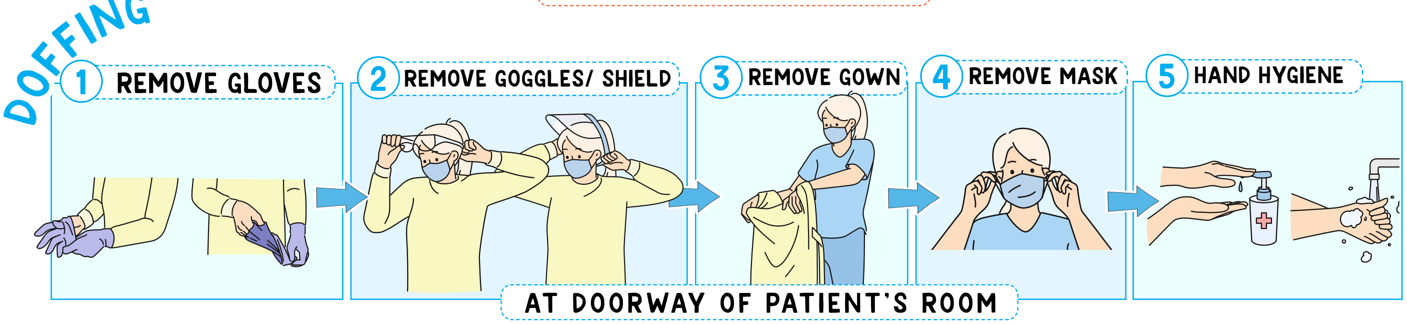
## DONNING



① HAND HYGIENE → ② GOWN → ③ MASK → ④ GOGGLES/ SHIELD → ⑤ GLOVES

BEFORE ENTERING ROOM

## DOFFING



① REMOVE GLOVES → ② REMOVE GOGGLES/ SHIELD → ③ REMOVE GOWN → ④ REMOVE MASK → ⑤ HAND HYGIENE

AT DOORWAY OF PATIENT'S ROOM

## 5 MOMENTS OF HAND HYGIENE

① Before touching a patient
② Before clean/ aseptic procedure
③ After body fluid exposure risk
④ After touching a patient
⑤ After touching patient surroundings

## MEDICAL ASEPSIS

**"CLEAN TECHNIQUE"**

**Reduces** number of pathogens

**USED IN:**

- → Administration of meds
- → Tube feeds
- → Daily hygiene

## SURGICAL ASEPSIS

**"STERILE TECHNIQUE"**

**Eliminates** all pathogens

**USED IN:**

- → Dressing changes
- → Catheterizations
- → Surgical procedures

# SAFETY

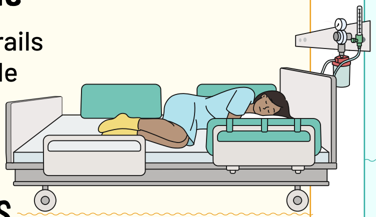
## PATIENT SAFETY

### FALL PRECAUTIONS

- Conduct fall assessment at least once per shift
- Place items in reach of patient
- Make sure bed alarm is on and call bell in reach
- Hourly rounding

### SEIZURE PRECAUTIONS

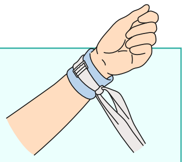
- Seizure pads against side rails
- Suction available at bedside
- Bed in low position
- Oxygen set up



### SUICIDE PRECAUTIONS

- 1:1 sitter continuously; patient cannot be left alone at any time
- Encourage patient to discuss feelings and anxieties
- Remove all objects that have potential to inflict harm
  - Cords
  - Curtains
  - Medical equipment
  - Silverware
  - Belts
  - Mirrors & sharps

## RESTRAINTS



- ONLY use restraints as last resort
- Require MD order
- MUST be released and reassessed every 2 hours (for non-violent restraints)
- Remove restraints as soon as feasibly possible

**4 SIDE RAILS UP QUALIFIES AS A RESTRAINT AND REQUIRES A DOCTOR'S ORDER!**

### RESTRAINT ALTERNATIVES

**ACTIVITY BELT**

Good for confused patients in need of stimulation

**1:1 SUPERVISION (SITTER)**

UAP sits with patient with intention of reorienting and relaxing them

**MODIFIED ENVIRONMENT**

Reduce stimulation such as bright lights and loud noises that may be causing agitation

## FIRE SAFETY

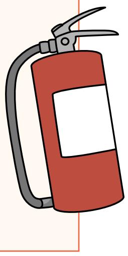
**PREVENTION IS KEY:** Follow all safety protocols per your facility

### DURING A FIRE

**R** Rescue and remove patients
**A** Activate the alarm
**C** Confine the fire
**E** Extinguish the fire

### USING AN EXTINGUISHER

**P** Pull the pin
**A** Aim the nozzle at fire's base
**S** Squeeze the handle
**S** Sweep from side to side



## NURSE SAFETY

### SAFE PATIENT HANDLING

- Avoid twisting and bending at the waist
- Have patient assist with positioning when able
- NEVER try to move a patient up in bed by yourself
- Use mechanical lifts when available

### SHARP INJURY PROTECTION

- NEVER recap needles- always use safety lock
- Point needle AWAY from you at all times
- Immediately dispose of needles in sharps-approved container

**WHAT TO DO FOR A NEEDLE STICK:**

① STOP what you're doing & clean area with soap & water
② Notify charge nurse/ manager (or per facility protocol)
③ Will have blood drawn for tests like HIV, Hepatitis, etc.
④ If patient positive for HIV or Hepatitis, may be recommended to start prophylaxis med treatment

# SCOPE OF PRACTICE

## SCOPE OF PRACTICE

| TASK | RN | LPN | UAP |
|---|---|---|---|
| Vital Signs | ✓ | ✓ | ✓ |
| Primary Assessment & Education | ✓ | | |
| Reassessment | ✓ | ✓ | |
| ADL's | ✓ | ✓ | ✓ |
| Hygiene | ✓ | ✓ | ✓ |
| Starting Blood Products | ✓ | | |
| Monitor Blood Products | ✓ | ✓ | |
| Administer Oral Medications | ✓ | ✓ | |
| Administer IV Meds | ✓ | | |
| Administer Oral Narcotics | ✓ | ✓ | |
| Measure I&O | ✓ | ✓ | ✓ |
| Insert Catheter & NGT | ✓ | ✓ | |
| Set Up Care Plans | ✓ | | |

## 5 RIGHTS OF DELEGATION

**RIGHT** Task
**RIGHT** Circumstance
**RIGHT** Person
**RIGHT** Supervision
**RIGHT** Direction (& Communication)

**REMEMBER:**

DON'T DELEGATE
WHAT YOU CAN

**EAT!**

**E**VALUATE
**A**SSESS
**T**EACH

## HOW TO DELEGATE

To properly delegate, ask yourself, out of all your tasks:

**WHAT CAN ONLY YOU DO?**

**WHAT TASK IS THE MOST URGENT?**

**HOW LONG WILL MY MOST URGENT TASKS TAKE?**

### NOTE

A few tips for making & managing delegation-based decisions:

- → Always make sure the person you're delegating to is capable of performing the task
- → Communicate clear parameters of what to alert you about
- → Try to briefly meet with CNA's at start of shift to get on the same page of each other's workloads to plan accordingly

# PRIORITIZATION

## HOW TO DECIDE WHAT IS URGENT

### STABLE VS. UNSTABLE

Always prioritize patients that are **actively** deteriorating from their baseline

**EXAMPLE:**

**TWO PATIENTS WITH HR 120:**

**PATIENT A:** is symptomatic

**PATIENT B:** is asymptomatic
(no chest pain, SOB, hypotension, etc.)

The **symptomatic** patient, **PATIENT A**, takes priority.

### EXPECTED VS. UNEXPECTED

Always proritize patients with symptoms **unexpected** for disease process

**EXAMPLE:**

**TWO PATIENTS WITH NAUSEA:**

**PATIENT A:** is s/p surgery & is **expected**

**PATIENT B:** is acutely nauseas & also has other **unexpected** symptoms (abd pain, etc.)

The **unexpectedly symptomatic** patient, **PATIENT B**, takes priority to obtain more information

### ACTUAL VS. POTENTIAL

Always prioritize patients with **current** problems over potential problems

**EXAMPLE:**

**TWO PATIENTS WITH HYPOTENSION:**

**PATIENT A:** is getting dialysis & has **potential** to become hypotensive

**PATIENT B:** is s/p surgery and is **currently** hypotensive

The patient that presents with a **current problem**, **PATIENT B**, takes priority.

### ACUTE VS. CHRONIC

Always proritize patients with **acute** problems over chronic problems

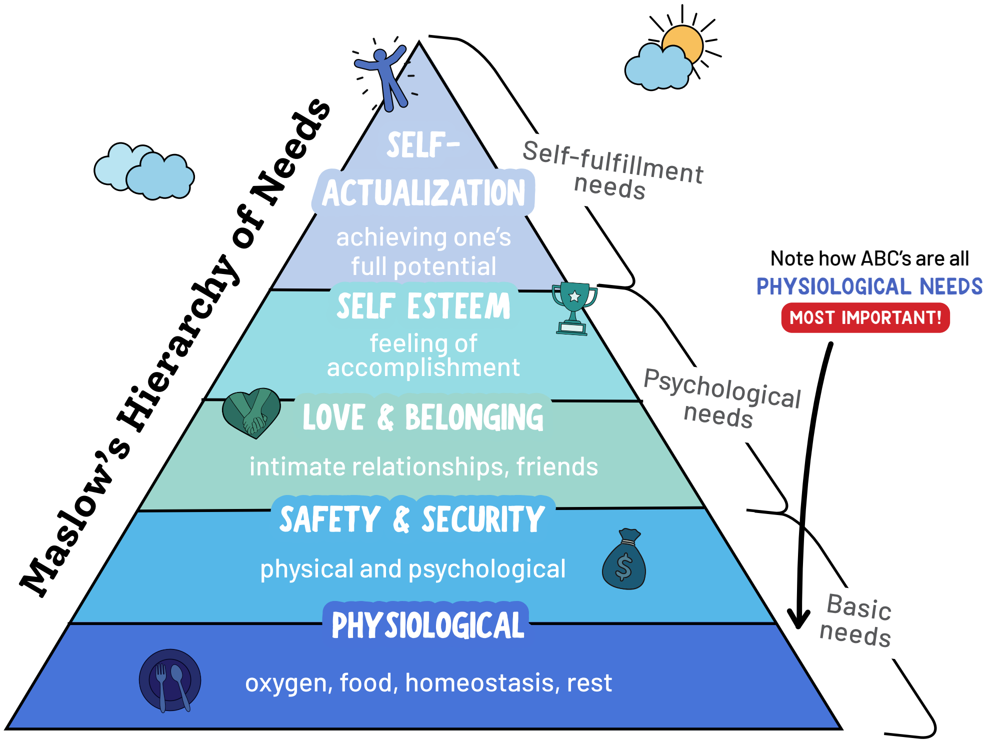
**EXAMPLE:**

**TWO PATIENTS WITH BP 90/50:**

**PATIENT A:** is on milrinone gtt and is chronically hypotensive (due to medication)

**PATIENT B:** has no history of hypotension and usual BP is around 120/80

The patient with an **acute problem**, **PATIENT B**, takes priority to obtain more information



Maslow's Hierarchy of Needs

**SELF-ACTUALIZATION**
achieving one's full potential

**SELF ESTEEM**
feeling of accomplishment

**LOVE & BELONGING**
intimate relationships, friends

**SAFETY & SECURITY**
physical and psychological

**PHYSIOLOGICAL**
oxygen, food, homeostasis, rest

Self-fulfillment needs

Psychological needs

Basic needs

Note how ABC's are all **PHYSIOLOGICAL NEEDS**
**MOST IMPORTANT!**

### FIRST ADDRESS ABC'S

**AIRWAY**
Does the patient have a patent airway?

**BREATHING**
Is the patient able to breathe comfortably?

**CIRCULATION**
Does the patient have adequate blood perfusion?

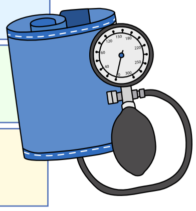
**THEN YOU CAN ADDRESS**
- → Safety
- → Discomfort
- → Education
- → Feelings

# VITAL SIGNS

## BLOOD PRESSURE

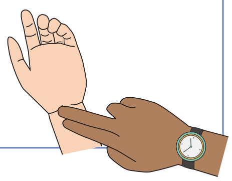
120
80

| STAGE | SYSTOLIC | | DIASTOLIC |
|---|---|---|---|
| HYPOTENSIVE | <90 | | <60 |
| NORMAL | <120 | AND | <80 |
| ELEVATED | 120–129 | AND | <80 |
| STAGE 1 | 130–139 | OR | 80–89 |
| STAGE 2 | 140 & ABOVE | OR | 90 & ABOVE |
| HYPERTENSIVE CRISIS | >180 | AND/ OR | >120 |



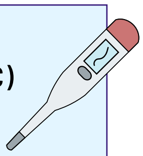
## PULSE

**NORMAL:** 60-100
**>100:** tachycardia
**<60:** bradycardia



## TEMPERATURE

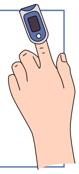
**NORMAL:** 97.8-99F (36.5-37.2 C)
**<95F (35 C):** Hypothermia
**>104F (40 C):** Hyperthermia



## OXYGEN SATURATION

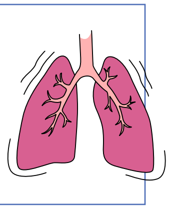
**NORMAL:** 94-100%
**LOW OXYGEN:** Hypoxia

Some patients may naturally present with lower levels
**EX:** COPD PATIENTS



## RESPIRATIONS

**NORMAL:** 12-20
**<12:** Bradypnea
**>20:** Tachypnea



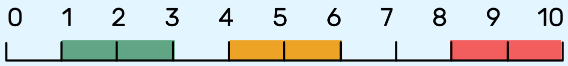
## PAIN

Subjective data given by patient or objective data assessed by nurse (use pain scale based on situation)

SUBJECTIVE SCALES

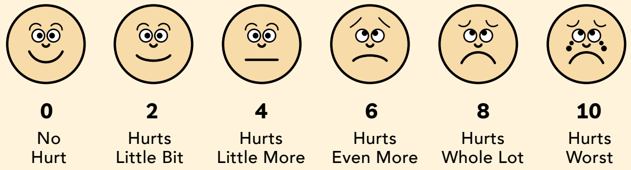
### NUMERICAL SCALE

Patient rates pain on scale 1-10



### FACES SCALE

Patient selects pictures on chart that matches pain level



OBJECTIVE SCALES

### PAINAD SCALE

PAIN ASSESSMENT IN ADVANCED DEMENTIA

→ **Assesses five behaviors:** breathing, negative vocalization, facial expression, body language, and the ability to be consoled

### CPOT SCALE

CRITICAL CARE PAIN OBSERVATIONAL TOOL

→ Used in intubated and non-intubated critically ill patients

→ Assesses objective factors such as facial expression, body movements, muscle tension, compliance with ventilator & vocalization

# HEAD-TO-TOE ASSESSMENT

## ASSESSMENT ORDER

① **INSPECT:** Assess visually
② **PALPATE:** Examine using touch
③ **PERCUSS:** Strike or tap area and assess sound
④ **AUSCULTATE:** Listen with stethoscope

## INTRO

- → Knock and introduce self
- → Wash hands
- → Provide privacy
- → Verify name and DOB
- → Explain what you're doing in simple language

**While introducing self, gain a basic assessment of the overall appearance of the patient:**

- ▶ Does the patient appear well groomed?
- ▶ Any lesions, masses, or skin breakdown noted?
- ▶ Any asymmetry in the body or face?

## NEURO

### ORIENTATION

Ask these questions:

- ▶ What is your name? **(PERSON)**
- ▶ Do you know where you are? **(PLACE)**
- ▶ Do you know what month it is? **(TIME)**
- ▶ Do you know what you're doing here? **(SITUATION)**

**TO GET MORE SPECIFIC:**

Ask patient what the current year is or who the president is

(healthy people forget what day it is so not the best way to assess orientation)

| | |
|---|---|
| **AAOX1:** | Oriented to person only |
| **AAOX2:** | Oriented to person & place OR time |
| **AAOX3:** | Oriented to person, place AND time |
| **AAOX4:** | Oriented to person, place, time & situation |

### LEVEL OF CONCIOUSNESS (LOC)

| | |
|---|---|
| **AWAKE:** | Alert, responds immediately to verbal commands |
| **CONFUSED:** | Impaired judgement & decision making, impulsive |
| **DISORIENTED:** | Impaired memory and orientation to self |
| **LETHARGIC:** | Drowsy, easily aroused with minimal stimuli |
| **OBTUNDED:** | Aroused by non-painful stimuli |
| **STUPOROUS:** | Only aroused by repeated vigorous stimulation |
| **COMATOSE:** | No response to verbal or painful stimuli |

## HEAD, FACE & NECK

### HEAD

- → Inspect head/scalp/ hair
- → Palpate head/scalp/ hair

### FACE

- → Assess face for asymmetry
- → Assess Cranial Nerve 7

**CRANIAL NERVE 7**

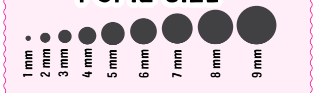
- ▶ Raise eyebrows
- ▶ Smile
- ▶ Frown
- ▶ Show teeth
- ▶ Puff out cheeks
- ▶ Squeeze eyes shut

### EYES

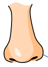
- → Assess conjunctiva and sclera color
- → Assess for any discharge
- → Assess **PERRLA**

**P**UPILS
**E**QUAL
**R**OUND
**R**EACTIVE TO
**L**IGHT &
**A**CCOMODATION

**PUPIL SIZE**



### NOSE



- → Assess for symmetry & present lesions
- → Palpate sinuses

### EARS

- → Assess for symmetry & present lesions
- → Any hearing devices or trouble hearing?

### MOUTH

- → Assess mucosa color: is it pink, pale, red, discolored?
- → Is it dry or moist?
- → Are there old debris or lesions?

**MAKE SURE TO CHECK CHEEKS & TONGUE**

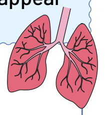
### NECK

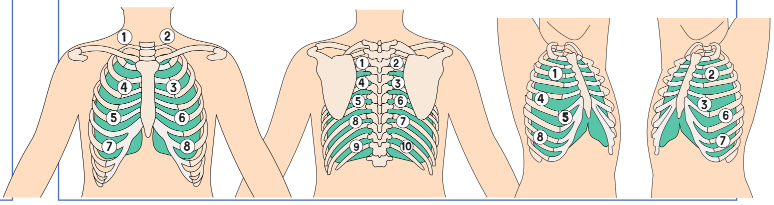
- → Assess neck for symmetry
- → Palpate neck for lumps, and/or swelling
- → Palpate carotid pulses

## RESPIRATORY

- → Inspect work of breathing
- → Palpate chest expansion
- → Auscultate lungs

- ▶ Is it labored or unlabored?
- ▶ Regular or irregular?
- ▶ Does the patient appear comfortable?





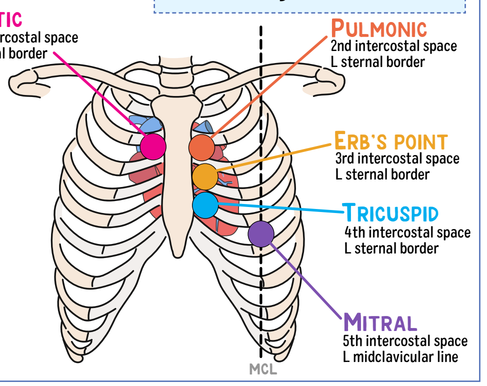
# HEAD-TO-TOE ASSESSMENT
## (CONTINUED)

## CARDIAC

Auscultate heart sounds

- Are they regular or irregular?
- Any murmurs, muffled, or whooshing heart sounds?

**A** ALL
**P** PEOPLE
**E** ENJOY
**T** TIME
**M** MAGAZINE

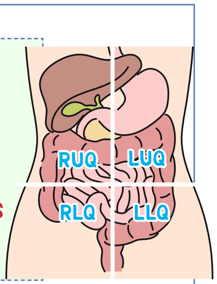

AORTIC
2nd intercostal space
R sternal border
PULMONIC
2nd intercostal space
L sternal border
ERB'S POINT
3rd intercostal space
L sternal border
TRICUSPID
4th intercostal space
L sternal border
MITRAL
5th intercostal space
L midclavicular line
MCL

## ABDOMEN

### ASSESSMENT ORDER CHANGES:

1. INSPECT
2. AUSCULTATE
3. PERCUSS
4. PALPATE

PALPATING AND PERCUSSING BEFORE AUSCULTATING MAY PRODUCE FALSE BOWEL SOUNDS


RUQ
LUQ
RLQ
LLQ

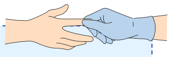
- Inspect color, contours, scars, etc.
- Auscultate starting in **RLQ & move clockwise**
- Percuss for tympany or dullness
- Palpate lightly in all 4 quadrants

**HYPERACTIVE:** >30 sounds per minute (may be able to hear without stethoscope)
**NORMOACTIVE:** 5-30 sounds per minute
**HYPOACTIVE:** <5 sounds per minute
**ABSENT:** Must listen for **at least 5 minutes** to confirm absent bowel sounds

## UPPER EXTREMITIES

- Inspect for lesions, scars, swelling, tenderness, color, texture, etc.
- Palpate radial pulses bilaterally
- Assess strength (have patient squeeze hands)

### CAPILLARY REFILL



Press finger for a few seconds & count how long it takes to regain color

NORMAL <2–3 SECONDS

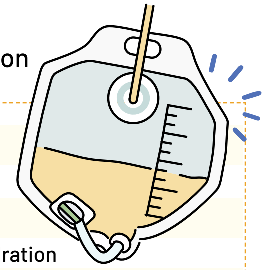
### PULSE SCALE

4+ BOUNDING
3+ INCREASED
2+ NORMAL
1+ WEAK
0 ABSENT

If no pulse found MUST check with doppler

## URINARY

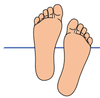
- Assess if patient has foley catheter, external catheter, or voids on their own
- Assess color and quantity
- Palpate bladder for any distention



### URINE COLOR MEANINGS:

**CLEAR:** Overhydration
**PALE YELLOW:** Normal
**AMBER:** Dehydrated
**BROWN:** Liver disease or severe dehydration
**PINK/ RED:** Possible blood, food dye, kidney disease
**GREEN:** Possible effect from medication or bacterial infection

## LOWER EXTREMITIES



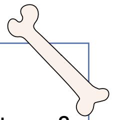
- Inspect color, hair distribution, any lesions or swelling
- Palpate for edema (pitting or non-pitting)
- Check cap refill
- Assess strength (have patient flex & press feet against hands)
  - Is strength equal bilaterally, or is one side weaker?

### PULSE CHECK

FEMORAL
↑
POPLITEAL
↑
POSTERIOR TIBIAL
↑
DORSALIS PEDIS (PEDAL)
START HERE

- Start at pedal pulse
- Move UP to next landmark
- If unable to feel a pulse, check with a doppler

## MUSCULOSKELETAL



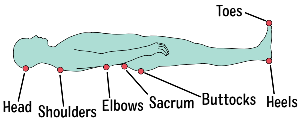
**During your assessment take note:**

- Is the patient easily moving or do they require assistance?
- Are there any gait abnormalities?
- Is one side weaker than the other?

## SKIN

- Throughout assessment, take note of any lesions, rashes, discoloration, or skin breakdown
- Make sure to check patient's points of contact!

### POINTS OF CONTACT


Toes
Head
Shoulders
Elbows
Sacrum
Buttocks
Heels

Any bony prominences such as the sacrum and heels can start to break down **FAST** if the patient is malnourished with other risk factors

# LAB VALUES CHEAT SHEET

## CBC

**WBC:** 4,000- 11,000 / uL

**RBC:** 4.5-5.5 / uL

**PLT:** 150,000-450,000 / uL

**HGB:** MALE 13-18 g/dL
FEMALE 12-16 g/dL

**HCT:** MALE 42%-52%
FEMALE 37%-47%

## BMP

**SODIUM:** 135-145 mEq/ L

**POTASSIUM:** 3.5-5 mEq/ L

**CHLORIDE:** 95-105 mEq/ L

**BUN:** 10-20 md/ dL

**CREATININE:** 0.6-1.2 mg/ dL

**GLUCOSE:** 70-100 mg/ dL (fasting)

**CALCIUM:** 9-11 mg/ dL

**ALBUMIN:** 3.4- 5.4 g/ dL

**TOTAL PROTEIN:** 6.2-8.2 g/ L

## COAGS

**PT:** 10-13 secs

**PTT:** 25-35 secs

**APTT:** NOT ON WARFARIN 30-40 secs
ON WARFARIN 47-70 secs

**INR:** NOT ON WARFARIN <1 sec
ON WARFARIN 2-3 secs

## LIPIDS

**TOTAL CHOLESTEROL:** <200 mg/ dL

**TRIGLYCERIDES:** <150 mg/ dL

**LDL:** <100 mg/ dL
↳ LOUSY CHOLESTEROL- WANT LOW LEVELS

**HDL:** >60 mg/ dL
↳ HAPPY CHOLESTEROL- WANT HIGH LEVELS

## RENAL

**CALCIUM:** 9-11 mg/ dL

**MAGNESIUM:** 1.5-2.5 mg/ dL

**PHOSPHATE:** 2.5- 4.5 mg/ dL

**GFR:** 90- 120 mL/min

**BUN:** 10-20 md/ dL

**CREATININE:** 0.6-1.2 mg/ dL

## A1C

**NON-DIABETIC:** 4-5.6%

**PRE-DIABETIC:** 5.7-6.4%

**DIABETIC:** > 6.5%

**TARGET FOR DIABETIC:** < 6.5%

## LFT

**ALT:** 7-56 U/ L

**AST:** 5-40 U/ L

**ALP:** 40-120 U/ L

**BILIRUBIN:** 0.1-1.2 mg/ dL

## PANCREAS

**AMYLASE:** 30-110 U/ L

**LIPASE:** 0-150 U/ L

## ABG

**pH:** 7.35- 7.45

**PACO2:** 35-45 mmHg

**HCO3:** 22- 26

**PAO2:** 80-100 mmHg

## OTHER

**BMI NORMAL RANGE:** 18.5- 24.9

**ICP:** 5-15 mmHg

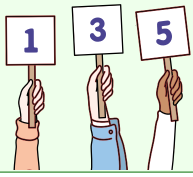
**I & O TARGET:** > 30/hr

# LAB VALUES MEMORY TRICKS

## BMP

### SODIUM 135–145 MEQ/ L

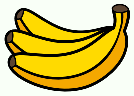
**ODD NUMBERS:** 1,3,5 = 135



### POTASSIUM 3.5–5 MEQ/ L

3-5 bananas per bunch
& get them **HALF** off

USE TO REMEMBER THE 1/2



### BUN 5–20 MG/ DL

**BUN**ion:
- ⋆ **5** digits/limb,
- ⋆ **20** digits total

### CREATININE 0.6–1.2 MG/ DL

0.9 **(NINE)** is right in the middle

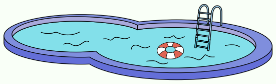
0.6 ⊢—⊣ 0.9 ⊢—⊣ 1.2

### GLUCOSE 70–100 MG/ DL

Energy is low at **70-100** years old

### CHLORIDE 95– 105 MEQ/ L

Best time to go in pool is when it's **95-105** degrees outside



### MAGNESIUM 1.5–2.5 MG/ DL

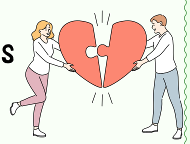
**MAG**nifying glass magnifies **1.5- 2.5X**

### PHOSPHOROUS 2.5–4.5 MG/ DL

"FOR US"

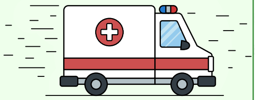
PHOR=4, US=2 LETTERS

THINK OF TWO HALVES TO REMEMBER THE 0.5!



### CALCIUM 9–11 MG/ DL

CALL 9-11



## CBC

### HGB MALE 13–18 G/DL FEMALE 12–16 G/ DL

**HE GOT BIGGER**

Think **puberty** ages

MALES: 13–18
WOMEN: 12–16

THINK WOMEN MATURE FASTER THAN MEN

### HCT MALE 39–54% FEMALE 36–48%

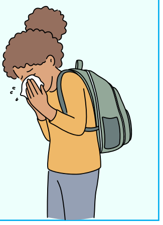
You only need to remember HGB range then **multiply by 3**

13 X 3 = 39
18 X 3 = 54 > MALE

12 X 3 = 36
16 X 3 = 48 > FEMALE

### WBC 4000–11000 U/ DL

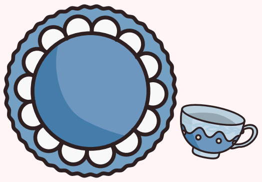
"Kids ages **4-11** always get sick"



## COAGS

### PLT 150,000–450,000 /UL

China PLATES cost **$150- $400**



### PT 10–13 SECONDS

PreTeen is **10-13** years old

### PTT 25–35 SECONDS

**PROPER TRAINING TIME**

Age of most professional athletes is **25-35** years old

## ELECTROLYTE IMBALANCES:

# SODIUM IMBALANCE

## HYPERNATREMIA

### LEVEL › 145

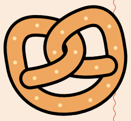
### SIGNS & SYMPTOMS

**REMEMBER** **"FRIED SALT"**

- **F** Flushed skin & low grade fever
- **R** Restless ,irritable, anxious, confused
- **I** Increased blood pressure, fluid retention
- **E** Edema, peripheral and pitting
- **D** Decreased urine output, dry mouth

- **S** Skin flushed
- **A** Agitation
- **L** Low Grade Fever
- **T** Thirst

### CAUSES



**Excessive intake**
- → Too much salty food
- → Hypertonic solutions in excess

**Loss of fluids**
- → Diarrhea
- → Diabetes Insipidus
- → Excessive sweating

**Decreased sodium excretion**
- → Kidney disease/dysfunction

### TREATMENT

**If due to excessive intake**
- → Restrict sodium intake
- → Educate patient on diet
- → Change/ stop IV fluids

**If due to volume loss**
- → Administer IV fluids

**If due to inadequate renal excretion**
- → Administer diuretics that promote sodium loss

### FUNCTIONS

- ▸ Balances fluid volume
- ▸ Balances blood volume
- ▸ Regulates nerve impulses

**NORMAL RANGE:**
**135–145 MEQ/ L**

**SODIUM & POTASSIUM=OPPOSITES**

↑NA=↓K+ ↓NA =↑K+

## HYPONATREMIA

### LEVEL ‹135

### SIGNS & SYMPTOMS

**REMEMBER** **"SALT LOSS"**

- **S** Stupor, coma
- **A** Anorexia, Nausea/vomiting
- **L** Lethargy
- **T** Tendon Reflexes Decreased

- **L** Limp muscles (weakness)
- **O** Orthostatic hypotension
- **S** Seizures/ headache
- **S** Stomach cramping

### CAUSES

**Excess of fluids= dilution**
- → CHF
- → Hypotonic fluids
- → Liver failure
- → Excessive water intake

**Insufficient sodium intake**
- → NPO
- → Anorexia

4 D's **Increased sodium excretion**
- → **D**iuretics (loop & thiazide)
- → **D**iarrhea, vomiting
- → **D**ehydration (excessive sweating)
- → **D**rains (NGT suction)

### TREATMENT

**If due to hypovolemia**
- → Administer sodium chloride infusion

**If due to hypervolemia**
- → Give diuretics

**If due to excessive H20 intake**
- → Restrict fluids
- → Educate patient

### NURSING CARE

- → Assess mental status to monitor change in LOC
- → Safety precautions
  - ▸ Call light
  - ▸ Bed alarm on

## ELECTROLYTE IMBALANCES:

# POTASSIUM IMBALANCE

## HYPERKALEMIA

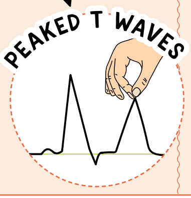
LEVEL › 5

Potassium imbalance can quickly lead to **LETHAL** dysrhythmias
**REQUIRES URGENT ACTION!**

### SIGNS & SYMPTOMS

**REMEMBER "MURDER"**

- **M**uscle cramps & weakness
- **U**rine; oliguria, anuria
- **R**espiratory distress
- **D**ecrease cardiac contractility
- **E**KG changes
- **R**eflexes; decreased DTR's



### CAUSES

- **Burns or tissue damage:** K+ leaves lysed cells
- **Addison's:** results in hypoaldosteronism, leading to K+ retention

**Excessive intake**
- Rapid intake of sodium-containing solutions

**Medications**
- ACE inhibitors (retain K+)
- Potassium sparing diuretics (spironolactone)
- NSAIDs

**Decreased K excretion**
- Kidney disease (dialysis patients)

### TREATMENT

- Monitor EKG

**If due to excessive intake**
- Stop potassium solutions
- Restrict potassium in diet

**If due to decreased excretion**
- Potassium wasting diuretics (Furosemide)
- Dialysis

**EMERGENT TREATMENT**

If EKG changes present:
- **Calcium gluconate:** stabilizes cardiac resting membrane
- **Insulin and Glucose:** shifts K+ back into cells temporarily

### FUNCTIONS

- Balances fluid volume
- Nerve transmission
- Heart contractility
- Muscle functioning

**NORMAL RANGE:**
**3.5–5 MEQ/ L**

**POTASSIUM & SODIUM=OPPOSITES**

↑K+ = ↓NA ↓K+ = ↑NA

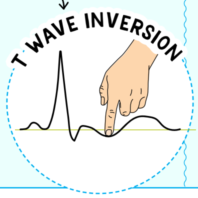
## HYPOKALEMIA

LEVEL <3.5

### SIGNS & SYMPTOMS

**REMEMBER THE 6 L'S**

- **L**ethargy and confusion
- **L**eg Cramps
- **L**imp muscles
- **L**ow, shallow respirations
- **L**ethal cardiac dysrhythmias
- **L**ots of urine (polyuria)



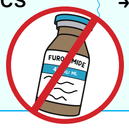
### CAUSES

**Poor potassium intake**
- NPO
- Fasting
- Malnutrition

**Movement of K+ from ECF to ICF**
- Alkalosis
- Excess insulin

**Dilution of serum potassium**
- Excess water intake
- Excess fluids without potassium

**Excess potassium loss**
- Potassium wasting diuretics (Furosemide)
- Vomiting, diarrhea
- NGT suction



### TREATMENT

If due to **inadequate intake or serum dilution**
- Potassium supplementation
  - PO (oral)
  - IV (given at 10 mEq/ hour)

**NEVER GIVEN IV PUSH**

Injecting potassium rapidly can cause **CARDIAC ARREST!**

- Hold potassium-wasting diuretics
- Monitor for EKG changes
- Monitor magnesium & calcium levels; often linked together

# ELECTROLYTE IMBALANCES:
# CALCIUM IMBALANCE

## HYPERCALCEMIA
LEVEL › 11

### SIGNS & SYMPTOMS

**REMEMBER "BACKME"**

- **B**one pain
- **A**rrhythmias
- **C**ardiac arrest
- **K**idney stones
- **M**uscle weakness
- **E**xcessive urination

### CAUSES

**Excessive intake**
- → Too much antacids with calcium (TUMs)

**Increased bone resorption of Ca**
- → **Hyperparathyroidism:** secretes too much PTH
- → **Malignancy:**bone destruction from cancer cells

**Increased absorption**
- → Thiazide diuretics
- → Kidney disease

### TREATMENT

- → Adequate hydration to avoid stone formation

**If due to excessive intake**
- → Stop calcium supplementation
- → Avoid high calcium foods

**If from increased absorption**
- → Stop thiazide diuretics
- → Avoid high calcium foods
- → **Last resort: dialysis**

**FALL RISK**
- At risk for pathological fractures (in both hypo & hyper)
- Call bell, bed alarm, safety precautions

**FUNCTIONS**
- Muscle contractions
- Bone regulation
- Blood clotting
- Hormone regulation

**NORMAL RANGE:**
**9–11 MG/DL**

**CALCIUM & PHOPHATE=OPPOSITES**

↑ CA = ↓ P    ↓ CA = ↑ P

## HYPOCALCEMIA
LEVEL ‹9

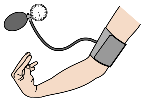
### SIGNS & SYMPTOMS

**REMEMBER "CATS GO NUMB"**

- **C**onvulsions
- **A**rrhythmias
- **T**etany
- **S**tridor and spasms

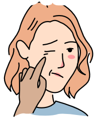
**GO NUMB**
Numbness in face, fingers, & limbs

**TROUSSEAU'S SIGN**



Spasm of hand & wrist caused by inflating BP cuff

**CHVOSTEK'S SIGN**



Spasm of facial muscles with light tap over facial nerve

### CAUSES

**Impaired absorption**
- → Vitamin D deficiency

**Increased excretion**
- → Kidney disease
- → Diarrhea
- → Wound drainage

### TREATMENT

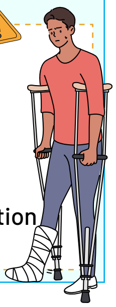
- → Calcium supplementation
  - PO (oral)
  - IV
- → Give calcium rich foods
  - Dairy
  - Sardines
  - Tofu
  - Leafy greens
  - Edamame
  - Lentils

**FALL RISK**

Patient is at risk for pathological fractures!

- Bed alarm
- Safety precautions
- Call bell in reach
- Assistance with ambulation
- Move CAREFULLY

applies to both hypocalcemia & hypercalcemia



## ELECTROLYTE IMBALANCES:

# MAGNESIUM IMBALANCE

## HYPERMAGNESEMIA

LEVEL >2.5

### SIGNS & SYMPTOMS

**THINK EVERYTHING LOW**

- LOW **energy** (drowsiness/ coma)
- LOW **HR** (bradycardia)
- LOW **BP** (hypotension)
- LOW **RR** (bradypnea)
- LOW **DTR** (hyporeflexia)
- LOW **bowel activity** (bowel sounds)

### CAUSES

**Excessive intake**

→ Magnesium containing antacids (TUMS) and laxatives

→ Magnesium supplementation

**Increased secretion into ECF**

→ DKA: causes fluid shifts= more Mg in blood

**Decreased excretion**

→ Renal insufficiency

### TREATMENT

**Excrete magnesium**

→ Diuretics

**Decrease magnesium intake**

→ Restrict diet of magnesium containing foods

→ Hold all magnesium containing laxatives and antacids

**Calcium gluconate**

→ Binds to excess magnesium & potassium in blood

→ **Last resort: dialysis**

### FUNCTIONS

- Relaxes muscles
- Cardiac functioning
- Regulation of blood glucose

**NORMAL RANGE:**
**1.5–2.5 MG/DL**

**MAGNESIUM & CALCIUM=SAME**

↑MG=↑CA ↓MG=↓CA

## HYPOMAGNESEMIA

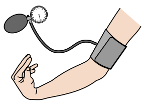
LEVEL <1.5

### SIGNS & SYMPTOMS

**THINK EVERYTHING HIGH**

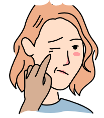
- HIGH **HR** (tachycardia)
- HIGH **BP** (hypertension)
- HIGH **DTR** (hyperreflexia)
- HIGH **RR** (fast & shallow)
- HYPERACTIVE **state**
  - irritability
  - seizures
  - twitches
  - confusion

**TROUSSEAU'S SIGN**



Spasm of hand & wrist caused by inflating BP cuff

**CHVOSTEK'S SIGN**



Spasm of facial muscles with light tap over facial nerve

Also seen in HYPOCALCEMIA: MG + CA rise & fall together

### CAUSES

**Insufficient intake**

→ Malnutrition

→ Vomiting, diarrhea

→ NGT suction

**Increased excretion**

→ Diuretics

→ Excessive alcohol use

**Intracellular movement of Mg**

→ Sepsis

→ Hyperglycemia & Insulin admin.

### TREATMENT

→ Mag supplementation

- PO (oral)
- IV: give SLOW!

→ **Seizure precautions**

→ Magnesium rich foods

- Chocolate
- Bananas
- Cauliflower
- Avocado
- Pumpkin
- Carrots

# ELECTROLYTE IMBALANCES:
# PHOSPHATE IMBALANCE

## HYPERPHOSPHATEMIA
LEVEL ›4.5

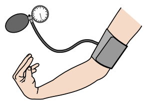
### SIGNS & SYMPTOMS

**SAME AS HYPOCALCEMIA**
(High **P** causes low **CA**)

- **C** Convulsions
- **A** Arrhythmias
- **T** Tetany
- **S** Stridor and spasms

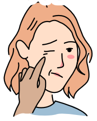
**GO NUMB**
Numbness in face, fingers, & limbs

**TROUSSEAU'S SIGN**



Spasm of hand & wrist caused by inflating BP cuff

**CHVOSTEK'S SIGN**



Spasm of facial muscles with light tap over facial nerve

### CAUSES

**Excessive intake**
- → Fleet/ sodium phosphate enemas

**Decreased excretion**
- → Kidney disease

**Increased absorption**
- → Vitamin D intoxication

**Excess excretion into blood**
- → Chemotherapy (kills good cells)

### TREATMENT

**Calcium acetate**
- → Binds to phosphate in food before it can be absorbed (take WITH food)

**Reduce phosphate intake**
- → Phosphate enemas
- → Restrict intake of phosphate rich foods

→ **Last resort: dialysis**

**FALL RISK** ⚠
- ▸ At risk for pathological fractures (in both hypo & hyper)
- ▸ Call bell, bed alarm, safety precautions

**FUNCTIONS**
- ▸ Metabolism of carbs/ fat/ protein
- ▸ Acid-base balance
- ▸ Bone & muscle formation

**NORMAL RANGE:**
**2.5–4.5 MG/DL**

**PHOSPHATE & CALCIUM=OPPOSITES**

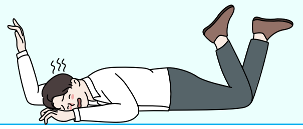
↑P =↓CA    ↓P =↑CA

## HYPOPHOSPHATEMIA
LEVEL ‹2.5

### SIGNS & SYMPTOMS

**REMEMBER "BROKEN"**

- **B** Breathing problems (muscle weakness)
- **R** Reflexes decreased (low DTR's)
- **O** Osteomalacia (weak bones)
- **K** Kills immune system function
- **E** Extreme weakness
- **N** Neuro Status Changes
  - irritability
  - seizures
  - confusion



### CAUSES

**Decreased absorption**
- → Antacids
- → Low Vitamin D
- → Excessive alcohol use
- → NGT suction

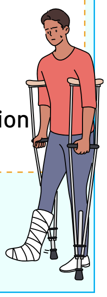
**Decreased intake**
- → Severe malnutrition

### TREATMENT

**Supplement phosphate**
- → Give WITH Vitamin D to help body absorb
- → Diet rich in phosphate foods

**FALL RISK** ⚠
Patient is at risk for pathological fractures!
- ▸ Bed alarm
- ▸ Safety precautions
- ▸ Call bell in reach
- ▸ Assistance with ambulation
- ▸ Move CAREFULLY

↳ **DUE TO HYPERCALCEMIA**



# DOSAGE CALCULATION
## RULES

1. **SHOW ALL YOUR WORK**

2. **LEADING ZEROES MUST BE PLACED BEFORE DECIMALS**
Decimal points can be missed without the zero.

**EXAMPLE:**
Instead of .5 mg, write 0.5 mg
.5 COULD BE MISTAKEN AS 5

3. **NO TRAILING ZEROES**
Decimal points can be missed & mistaken for a larger whole number.

**EXAMPLE:**
Instead of 5.0 mg, write 5 mg
5.0 COULD BE MISTAKEN AS 50

4. **NO ROUNDING UNTIL YOU HAVE THE FINAL ANSWER**
Rounding before you reach your final calculation can drastically change the answer you get. Make sure to use exact calculations and then when you are ready to round, use the rounding rules below.

## ROUNDING RULES

### ROUNDING ANY NUMBER
(unless otherwise instructed)

**IF NUMBER > 1:** round to the nearest **tenth**

**EXAMPLE:**
1.234 rounds to 1.2

**IF NUMBER < 1:** round to the nearest **hundredth**

**EXAMPLE:**
0.567 rounds to 0.57

### ROUNDING REFERENCE

| 1 | 2 | 3 | 4 | . | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| THOUSANDS | HUNDREDS | TENS | ONES | | TENTHS | HUNDREDTHS | THOUSANDTHS |

## ROUNDING TO THE NEAREST TENTH

If the number in the hundredths place is less than 5, round **down**.

**EXAMPLE:**
1.54 rounds to 1.5

If the number in the hundredths place is equal or greater than 5, round **up**.

**EXAMPLE:**
1.57 rounds to 1.6

## IV CALCULATION

- → IV infusions are calculated in either gtts/ min or mL/hour
- → gtt MUST be rounded to a whole number

**EXAMPLE:**
25.3 rounds to 25 gtt/ min

## ROUNDING TO THE NEAREST HUNDRETH

If the number in the thousandths place is 5 or greater, then the number in the hundredths place is rounded **up**.

**EXAMPLE:**
2.995 is rounded to 3

**EXAMPLE:**
2.975 is rounded to 2.98

If the number in the thousands place is 4 or less, then the number is **dropped**.

**EXAMPLE:**
0.993 is rounded to 0.99

## CAPSULES & TABLETS

- → Capsules must be rounded to a whole number (you can't split a capsule)
- → Tablets are rounded to nearest half

**CAPSULE EXAMPLE:**
1.7 rounds to 2 capsules

**TABLET EXAMPLE:**
1.4 rounds to 1.5 tablets

# DOSAGE CALCULATION

## FORMULAS

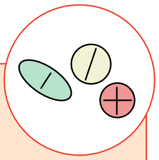
### CONVERSIONS

#### WEIGHT

1000 mcg= 1 mg
1000 mg= 1 g
1000 g= 1 kg
1 kg= 2.2 lbs
1 lb= 16 oz
2,000 lbs= 1 ton

#### VOLUME

1 tsp= 5 mL
1 tbsp= 15 mL
1 tbsp= 3 tsp
2 tbsp= 1 fl oz
1,000 mL= 1 L
30 mL= 1 fl oz
16 fl oz= 1 pint
2 pints= 1 quart
4 quarts= 1 gallon
8 pints= 1 gallon
8 fl oz= 1 cup
1 mL= 1 cc
1 cup= 240 mL
1 mL= 20 gtt
60 gtt= 1 tsp
1 dram= 5 mL



### TABLET DOSES

**FORMULA:**

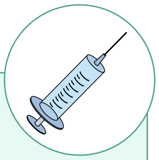
$$\frac{D \text{ (Dose Ordered)}}{H \text{ (Amount on Hand)}} \times Q \text{ (Quantity)} = A \text{ (Amount Needed)}$$

**EXAMPLE:**

Motrin 400 mg PO is ordered every 12 hours. The pharmacy stocks 200 mg tablets. How many tablets should be administered per dose?

$$\frac{D}{H} = \frac{400 \text{ MG}}{200 \text{ MG}} \times 1 \text{ TABLET (Q)} = \boxed{2 \text{ TABLETS}}$$

ANSWER



### INJECTABLE DOSES

**FORMULA:**

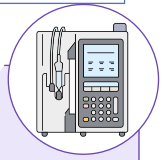
$$\frac{D \text{ (Dose Ordered)}}{H \text{ (Amount on Hand)}} \times V \text{ (Volume)} = A \text{ (Amount Needed)}$$

**EXAMPLE:**

An order for Furosemide 20 mg is placed. The pharmacy stocks Furosemide 100 mg/10 mL. How many mL will you need to administer a 20 mg dose?

$$\frac{D}{H} = \frac{20 \text{ MG}}{100 \text{ MG}} \times 10 \text{ ML (V)} = \boxed{2 \text{ ML}}$$

ANSWER



### IV FLOW RATE WITH PUMP

**FORMULA:**

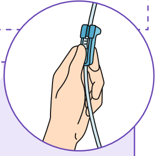
$$\frac{V \text{ (mL of solution)}}{T \text{ (Time)}} = \text{ML/ HOUR}$$

**EXAMPLE:**

The doctor orders NS 1000 mL to be given over 8 hours. What rate do you need to set the pump to?

$$\frac{V}{T} = \frac{1000 \text{ ML}}{8 \text{ HOURS}} = \boxed{125 \text{ ML/HR}}$$

ANSWER



### IV FLOW RATE WITH DROPS

**FORMULA:**

$$\frac{V \text{ (mL of solution)}}{T \text{ (Time)}} \times \text{DROP FACTOR} = \text{GTT/ MIN}$$

**EXAMPLE:**

The doctor orders D5W 1000 mL to be infused over 8 hours. The tubing you're using has a drop factor of 10 gtt/mL. What do you need to set the gtt/min to?

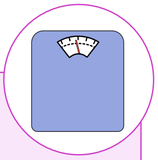
**STEP 1:** Convert hours to minutes

$$\frac{8 \text{ HOURS}}{\text{X MINS}} \times \frac{60 \text{ MINS}}{1 \text{ HOUR}} = \boxed{480 \text{ MINUTES}}$$

**STEP 2:** Plug in & solve the formula

$$\frac{V}{T} = \frac{1000 \text{ ML}}{480 \text{ MINS}} \times 10 \text{ GTT/ML} = 20.83 \xrightarrow{\text{rounds to}} \boxed{21 \text{ GTT/ MIN}}$$

ANSWER



### WEIGHT-BASED DOSES

**FORMULA:**

$$\frac{D \text{ (Dose Ordered)}}{H \text{ (Amount on Hand)}} \times KG \text{ (Pt Weight)} = A \text{ (Amount Needed)}$$

**EXAMPLE:**

The doctor orders Amoxicillin at 4 mg/ kg/ dose. The patient weighs 130 lbs. How many mg per dose will you administer?

**STEP 1:** Convert patient's weight from lbs to kg

$$\frac{130 \text{ LBS}}{2.2 \text{ KG}} = 59.09 \xrightarrow{\text{rounds to}} \boxed{59.1 \text{ KG}}$$

**STEP 2:** Plug in & solve the formula

$$\frac{D}{H} = \frac{4 \text{ MG}}{1 \text{ KG}} \times 59.1 \text{ KG} = \boxed{236.4 \text{ MG/ DOSE}}$$

ANSWER

# BLOOD TRANSFUSIONS

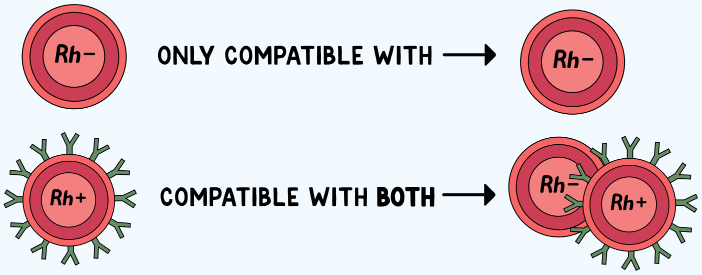
## BLOOD COMPATIBILITY

### RHESUS (RH) FACTOR

**An inherited protein found on the surface of RBCs**

If your blood has the protein, you have a **POSITIVE** blood type.

If your blood does **not** have the protein, you have a **NEGATIVE** blood type.



UNIVERSAL DONOR: O−

UNIVERSAL RECEIVER: AB+

| RECIPIENT BLOOD TYPES \ DONOR BLOOD TYPES | O+ | O− | A+ | A− | B+ | B− | AB+ | AB− |
|---|---|---|---|---|---|---|---|---|
| O+ | ● | ● | | | | | | |
| O− | | ● | | | | | | |
| A+ | ● | ● | ● | ● | | | | |
| A− | | ● | | ● | | | | |
| B+ | ● | ● | | | ● | ● | | |
| B− | | ● | | | | ● | | |
| AB+ | ● | ● | ● | ● | ● | ● | ● | ● |
| AB− | | ● | | ● | | ● | | ● |

## TYPES OF BLOOD PRODUCTS

| TYPE | PURPOSE | INDICATIONS |
|---|---|---|
| **WHOLE BLOOD** | Replace RBC, WBC, platelets, and plasma | Acute blood loss (trauma or surgery) |
| **PACKED RED BLOOD CELLS** | Replace RBC | Anemia or active GI bleed |
| **PLATELETS** | Prevent bleeding | Thrombocytopenia |
| **FRESH FROZEN PLASMA** | Rapid volume expansion & clotting factor deficiency | Clotting factor deficiencies, DIC, warfarin reversal |
| **CRYOPRECIPITATE** | Replace fibrinogen and other clotting factors | Hemophilia or other inherited bleeding disorders |

## BLOOD TRANSFUSION FACTS

- ⋆ Can only be started by RN
- ⋆ Only Normal Saline can be used with blood
- ⋆ Type & Screen is good for 72 hours
- ⋆ Blood must be started within **30 minutes** from time picked up from blood bank
- ⋆ Blood must be transfused within **4 hours** of starting

## TYPES OF TRANSFUSION REACTIONS

### HEMOLYTIC

Immune system is killing donor RBC

**SIGNS:**

- → Low back pain *1ST SIGN
- → Chills
- → Tachycardia

### SEPTIC

Tranfusion of contaminated blood

**SIGNS:**

- → Rapid onset of chills
- → High fever
- → Tachycardia

### FEBRILE

Recipient RBC reacting to donor RBC

**SIGNS:**

- → Increase in temp 1C from baseline
- → Flushing
- → Chills

### ALLERGIC

Immune system reacting to plasma proteins

**SIGNS:**

- → Flushing
- → Rash, hives
- → Itching

### CIRCULATORY OVERLOAD

Due to rapid transfusion

**SIGNS:**

- → Dyspnea
- → Crackles or rales
- → JVD

### NURSING ACTIONS

1. Stop the transfusion **IMMEDIATELY**!
2. Change IV tubing & run NS wide open
3. Notify the physician & blood bank
4. Have emergency medications ready

**DO NOT LEAVE THE PATIENT! REASSESS & MONITOR VS**

## STARTING A BLOOD TRANSFUSION

1. Verify patency of line
2. Verify consent signed by patient/ POA
3. Verify blood product & patient identity with 2nd RN
4. Take full set of vital signs PRIOR to starting transfusion
5. Spike blood on blood tubing & start infusion (start SLOW)
6. MUST stay with patient the first 15 minutes
7. Reassess vitals after 15 minute mark
8. Continue to monitor vitals every 30 min- 1 hour during infusion based on facility protocol

**MOST AT RISK FOR REACTION DURING FIRST 15 MINUTES OF TRANSFUSION**

# MEDICATION ADMINISTRATION

## 6 RIGHTS

- **RIGHT** Patient
- **RIGHT** Time
- **RIGHT** Dose
- **RIGHT** Medication
- **RIGHT** Route
- **RIGHT** Documentation

## TYPES OF ORDERS

**ROUTINE/STANDING:** given on regular schedule with or without end date

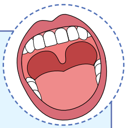
**ONE TIME:** given only once

**STAT:** given immediately

**PRN:** given as needed; must have indication for use such as pain or fever

## NONPARENTERAL ROUTES

### ORAL



Given by mouth for patient to ingest

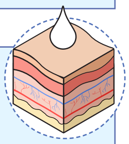
**DO NOT GIVE IF:**

- ✗ Actively vomiting
- ✗ Absent gag reflex
- ✗ NPO
- ✗ Decreased LOC

**ADMIN TIPS:**

- ▸Always sit patient up 90°
- ▸Assess for + swallow reflex
- ▸Never crush enteric coated meds!
- ▸Shake liquid meds well before giving

### TOPICAL



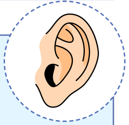
Applied to the skin or mucous membranes

**LOTION: DRY WOUNDS**

**CREAMS: WET WOUNDS**

> Ensure area is **CLEAN & DRY** before applying

### OTIC



- → Applied to the ears
- → Have patient tilt head

> **3 YEARS OLD:** pull pinna **UP** & back

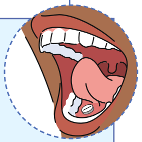
< **3 YEARS OLD:** pull pinna **DOWN** & back

**REMEMBER**

**OLDER UP**

**YOUNGER DOWN**

### SUBLINGUAL & BUCCAL



**SUBLINGUAL:** placed under tongue

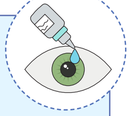
**BUCCAL:** placed between gum & cheeks

**DO NOT CRUSH, CHEW OR SWALLOW!**

### TRANSDERMAL

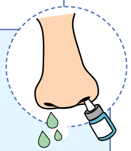
- → Placed on skin via patch
- → Ensure area is clean & dry
- → Rotate placement sites

### OPTHALMIC



- → Applied to lower lids or corner of the eye
- → Gently pull lower eyelid downwards
- → Keep dropper held 1-2 cm above eye

### NASAL



- → Applied via inhalation
- → Hold alternate nostril while admistering
- → Avoid blowing nose immediately after

## PARENTERAL ROUTES

### ID INTRADERMAL

Into the **dermis**

**ANGLE:** 10°, bevel up

**VOLUME:** < 0.5mL

**NEEDLE GAUGE:** 25-27g

**NEEDLE LENGTH:** 3/8-1/2"

**SITE:** Inner forearm, upper back below scapula

**DO NOT MASSAGE SITE AFTER REMOVING NEEDLE**

### IM INTRAMUSCULAR

Into the **muscle**

**ANGLE:** 90°

**VOLUME:** up to 3mL

**NEEDLE GAUGE:** 20-25g

**NEEDLE LENGTH:** 1-1.5"

**SITE:** Deltoid, ventrogluteal, vastus lateralis

**USE Z-TRACK METHOD**

### SQ SUBCUTANEOUS

Into the **fat**

**ANGLE:** 45°

**VOLUME:** 0.5-2mL

**NEEDLE GAUGE:** 25-27g

**NEEDLE LENGTH:** 3/8-5/8"

**SITE:** Abdomen, back of arm, upper-outer thigh

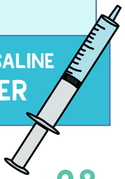
**ROTATE INJECTION SITES TO AVOID LIPOHYPERTROPHY**

### IV INTRAVENOUS

Into the **vein**

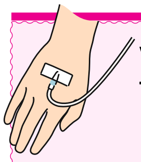
- → Given via IV push, piggyback, or continuous infusion
- → Maintain strict aseptic technique

**ALWAYS FLUSH WITH SALINE BEFORE & AFTER**



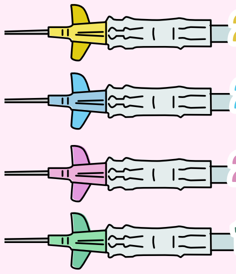
# IV LINE MANAGEMENT

## PERIPHERAL LINES



Venous access obtained through inserting a thin, flexible tube into a peripheral vein.

**THE BIGGER THE NUMBER, THE SMALLER THE GAUGE**

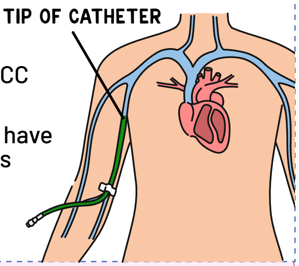


| | |
|---|---|
| **24G** | For very fragile, small veins |
| **22G** | IV fluids and medications |
| **20G** | IV fluids/ meds, contrast dye |
| **18G** | Rapid infusions, preferable for blood & CT scans with dye |

### MIDLINES

8-12 cm peripheral line where tip ends right below axilla

- Must be inserted by PICC nurse
- Used for patients that have difficult venous access
- Ultrasound guided to confirm patency



### SITES

- Basilic
- Antecubital
- Cephalic **WATCH OUT FOR RADIAL NERVE!**

### NURSING CARE

- Reassess site at least every 4 hours
- Flush with NS at least q12 when not in use
- Monitor site for phlebitis (don't block insertion site with dressing)

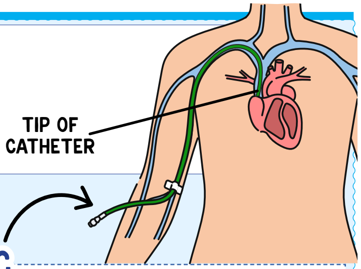
## CENTRAL VENOUS CATHETERS

Venous access gained through inserting a catheter into a large vein that ends in the superior vena cava.

**SOME MEDICATIONS REQUIRE A CENTRAL LINE AS THEY CAN CAUSE EXTRAVASATION IF INFILTRATED**

**TIP OF CATHETER ENDS IN SUPERIOR VENA CAVA**

Includes all types of central lines; the difference is the type of catheter & how it's inserted



### CORDIS

Short, large bore catheter inserted into a central vein

- Commonly used for patients that require large, rapid volume of blood or fluids
- Seen in trauma patients or patients with active unstable GI bleeds
- For short term use only

### PICC

**PERIPHERALLY INSERTED CENTRAL CATHETER**

Central line catheter inserted through a peripheral vein

- Inserted through basilic, brachial, cephalic, or medial cubital vein of arm
- Used in scenarios where patient requires long term IV therapy

**HIGH RISK FOR CLOTS & INFECTION!**

### PORT-A-CATH

Small, implantable port placed under the skin and connected to a central vein

- Commonly used in chemo patients
- For long-term use
- Lower infection risk

### NON-TUNNELED CENTRAL CATHETER

Catheter placed directly into a large central vein

- For short term use only
- Can be inserted through groin, neck, or subclavian
- Used in emergent situations where unable to obtain peripheral access or if patient needs certain medications that require central access

**SHORT TERM USE ONLY! HIGH RISK FOR INFECTION**

→ There are often hospital protocols in place to remove as soon as clinically possible to reduce risk of **CLABSI'S**

**CENTRAL LINE ASSOCIATED BLOODSTREAM INFECTION**
Bacteria or viruses enter the body through central line

### NURSING CARE

- Central line dressings must be changed using sterile technique
- Dressing changes every 7 days or when soiled
- CHG patch to reduce risk of infection

# IV THERAPY BASICS

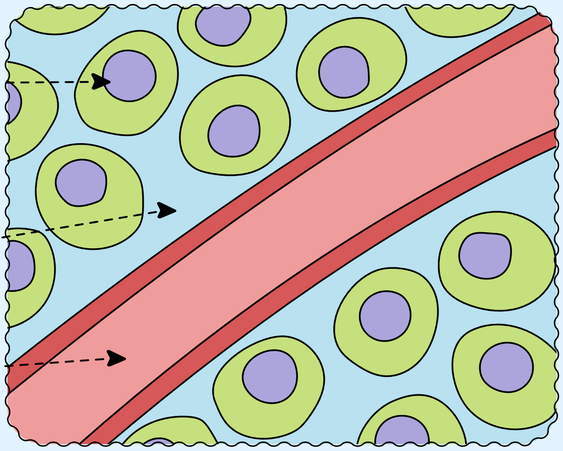
## ICF vs ECF

**INTRACELLULAR FLUID**
Fluid **INSIDE** the cell

**MAKES UP ABOUT TWO-THIRDS OF BODY'S WATER**

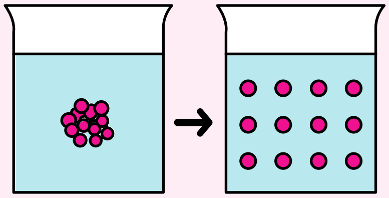
**EXTRACELLULAR FLUID**
Fluid **OUTSIDE** the cell

- **INTERSTITIAL FLUID**
  Fluid that surrounds the cell (in between cells)
- **INTERVASCULAR FLUID**
  Plasma/ fluid in blood vessels



## DIFFUSION vs OSMOSIS

### DIFFUSION



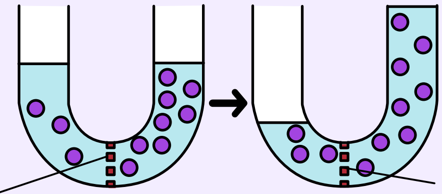
Movement of a solute from a **HIGHER** to **LOWER** concentration

**BOTH SOLUTE & SOLVENT MOVE**

**SOLUTE**
Substance being dissolved in solvent

**SOLVENT**
Substance capable of dissolving solutes
**(WATER)**

### OSMOSIS

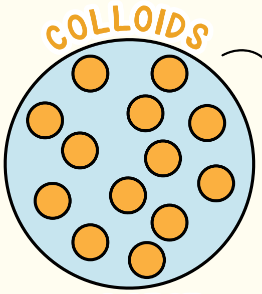


Movement of water through a **semipermeable membrane** from a **HIGHER** to **LOWER** concentration

**ONLY SOLVENT MOVES**

**WATER FOLLOWS SALT**
If sodium moves into the cell, water will follow & leave the extracellular space

## COLLOIDS vs CRYSTALLOIDS



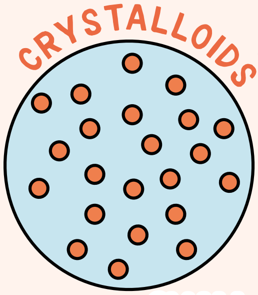
**MEMORY TRICK**
**COLL**oids are **COOL**, **LARGE** & handsome!

**LARGE MOLECULES**

**PLASMA EXPANDERS**

- Efficient at increasing blood fluid volume
- Act to retain existing fluid
- Promote movement of fluid into intravascular space

**EXAMPLE:** Albumin & Plasma
**RISK:** Harsher on kidneys



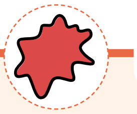
**MEMORY TRICK**
**CRYSTAL**loids are small like **CRYSTALS**

**SMALL MOLECULES**

- Provides immediate fluid resuscitation
- Are in intravascular compartment for < an hour
- Rapidly excreted in urine

**EXAMPLE:** NS & D5W
**RISK:** Can cause edema

# IV FLUID THERAPY



## HYPER TONIC

### PATHO

More salt than water in solution

↓

Vessel becomes more concentrated than the cell

↓

Water leaves the cells

↓

Cells **SHRINK**

### USES

- Hyponatremia
- Cerebral edema
- Hypovolemia

**VOLUME EXPANDERS**

Draws fluid out of cells into the **EXTRACELLULAR SPACE**

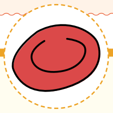
### EXAMPLES

Anything ABOVE 0.9% is **HYPERTONIC**

- 3% Saline
- 5% Saline
- 5% Dextrose in 0.9% Saline (D5NS)
- 5% Dextrose in LR (D5LR)
- 10% Dextrose (D10W)

### NURSING CONSIDERATIONS

- Monitor for hypervolemia
- High concentrations require central line due to risk of extravasation (D10)



## ISO TONIC

### PATHO

Solution equal parts water & solute

**+ SAME CONCENTRATION AS BLOOD PLASMA**

↓

Expands ICF & ECF equally

↓

Cells **STAY THE SAME SHAPE**

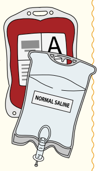
Do not shrink or swell

### USES

- Blood loss (Hemorrhage, burns, surgery)
- Shock
- Dehydration
- Fluid maintenance

**NORMAL SALINE**

ONLY fluid used when giving **BLOOD PRODUCTS**



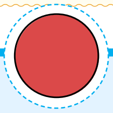
### EXAMPLES

- 0.9% Normal Saline (NS)
- Lactated Ringers (LR)
- 5% Dextrose (D5W)
  - D5W starts **ISOTONIC** and becomes **HYPOTONIC** when metabolized

### NURSING CONSIDERATIONS

Monitor for **HYPERVOLEMIA**

- Hypertension
- Crackles
- Peripheral edema



## HYPO TONIC

### PATHO

More water than salt in solution

↓

Vessel becomes less concentrated than the cell

↓

Water enters cells

↓

Cells **SWELL**

### USES

- Cellular dehydration
  - DKA and HHNS
  - Hypernatremia

**DRAWS FLUID INTO CELLS**

Can lead to **HYPONATREMIA** or **HEMOLYSIS** (cells swell & burst)

Anything BELOW 0.9% is **HYPOTONIC**

### EXAMPLES

- 0.45% Saline (1/2 NS)
- 0.33% Saline (1/3 NS)
- 0.225% Saline (1/4 NS)
- 5% Dextrose (D5W)
  - D5W starts **ISOTONIC** and becomes **HYPOTONIC** when metabolized

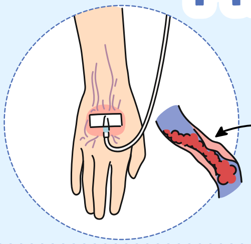
### NEVER GIVE IF....

- Risk for ↑ ICP
- Liver disease
- Trauma or burns

**FLUID SHIFTS CAN CAUSE CEREBRAL EDEMA & ↓ FLUID VOLUME**

# IV THERAPY COMPLICATIONS

## PHLEBITIS



Inflammation of vein

Can lead to
**THROMBOPHLEBITIS**
(blood clot)

### SYMPTOMS

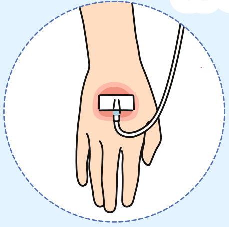
- Pain
- Redness
- Tenderness

MAY HAVE ↓ IV FLOW DUE TO OCCLUSION

### TREATMENT

- Remove IV
- Apply warm compress
- Monitor site

## INFECTION



Local or systemic infection entered through IV site

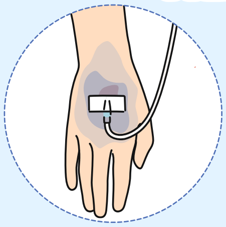
### SYMPTOMS

- Redness at site
- Fever
- Chills

### TREATMENT

- Remove IV
- Collect blood cultures
- Antibiotics may be ordered by MD

## HEMATOMA



Collection of blood in tissues

**CHECK LABS BEFORE REMOVING OR INSERTING IV'S**
Some patients may be more prone to hematomas if they have abnormal coags

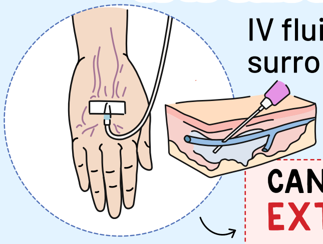
### SYMPTOMS

- Pain or discomfort at site
- Hard lump or swelling
- Bruising at site

### TREATMENT

- Remove IV
- Hold pressure
- Elevate extremity

## INFILTRATION



IV fluids leak into surrounding tissue

### SYMPTOMS

- Edema
- Pallor
- Pain
- Cool skin

### TREATMENT

- Remove IV
- Elevate extremity
- Apply cool or warm compress
- Monitor site

**CAN CAUSE EXTRAVASATION**
if **vesicant drug** leaks into surrounding tissue

**Can lead to:**

- Blisters
- Tissue sloughing
- Necrosis

**Vesicant examples:**

- Vasopressors
- Chemo agents
- High concentration IV fluids (D10)

## MAINTAINING IV LINES

- → Reassess site at least every 4 hours (more frequently if patient receiving fluids or irritants like antibiotics)
- → Flush site upon reassessment to ensure patency
- → Properly secure line to avoid dislodgement
- → Educate patient on IV site
- → Keep all IV sites labeled with date & time
- → Ensure all lines are properly documented

## DISCONTINUING IV LINES

① Have gauze & tape ready
② Stop any fluids running & clamp IV
③ Remove tape & dressing (IV catheter still in vein)
④ Place gauze over insertion site & press down while removing catheter
⑤ Secure with tape

**IF PART OF CATHETER TIP IS MISSING MUST NOTIFY MD**

# PRESSURE INJURIES

A **pressure injury (AKA pressure ulcer)** is a breakdown of skin integrity due to unrelieved pressure.

## RISK FACTORS

- → Immobility (bedridden patients)
- → Incontinence
- → Malnutrition (Albumin <3.5)
- → Elderly
- → Poor hygiene
- → Obesity
- → Diabetes, vascular disorders
- → Frequent skin friction

## BRADEN SCALE

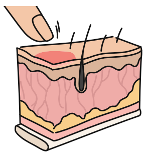
Scale used to assess risk of skin breakdown based on 6 categories:

① Sensory perception
② Moisture
③ Activity
④ Mobility
⑤ Nutrition
⑥ Friction and shear

| SCALE INTERPRETATION | |
|---|---|
| 19–23 | NO RISK |
| 15–18 | MILD RISK |
| 13–14 | MODERATE RISK |
| 10–12 | HIGH RISK |

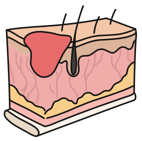
## PRESSURE INJURY STAGES

### STAGE 1



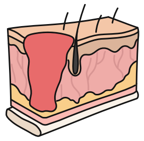
- → Intact skin (unbroken, no openings)
- → Non-blanchable redness
- → Area may be swollen & irritated

### STAGE 2



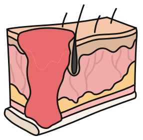
- → Skin NOT intact
- → Shallow, open ulcer (partial thickness loss)
- → Open/ closed blister
- → NO exposed fat

### STAGE 3



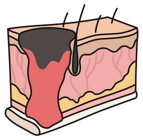
- → Full thickness skin loss
- → SubQ fat may be visible
- → NO exposed bone, muscle or tendon

### STAGE 4



- → Full thickness skin loss
- → Exposed bone, tendon, and/or muscle tissue
- → Tunneling or pockets

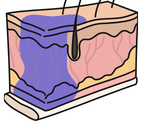
### UNSTAGEABLE



- → Full thickness skin loss
- → Ulcer based covered with eschar and/or slough
- → MUST be removed first in order to stage

### DTI

DEEP TISSUE INJURY



- → Purple or maroon skin OR blood filled blister
- → Non-blanchable, often looks bruise-like

RISK OF EVOLVING INTO STAGE 3 OR 4

## PRESSURE INJURY ASSESSMENT

### INITIAL ASSESSMENT:

- → Do full body check for any wounds or skin breakdown
- → Measure wounds and document measurements
- → Assess depth, color, full or partial thickness
- → Consult wound care nurse if within hospital policy

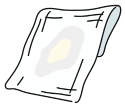
### REASSESSMENT:

- → Reassess wound once a shift and anytime dressing changes are ordered
- → Remeasure wound dimensions once a week or per hospital policy

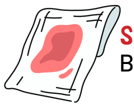
## WOUND DESCRIPTIONS

**DEHISCENCE:** Separation of edges
**DESICCATED:** Dry, dehydrated
**EDEMA:** Swelling of skin
**ERYTHEMA:** Redness of skin
**EVISCERATED:** Internal organ protruding through incision
**INDURATED:** Firm or hard skin around wound
**MACERATED:** Moisture, soggy, soft
**PERIWOUND:** Skin surrounding wound

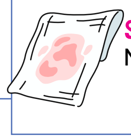
## TYPES OF DRAINAGE



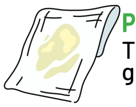
**SEROUS**
Clear and thin



**SANGUINEOUS**
Bloody



**SEROSANGUINEOUS**
Mix of blood & serous



**PURULENT**
Thick, yellow/ green, pus like

## PRESSURE INJURY PREVENTION

### SKIN HYGIENE

- → Clean incontinent patients
- → Apply barrier creams for incontinence
- → Avoid scrubbing or rubbing skin while cleaning

### ADEQUATE NUTRITION

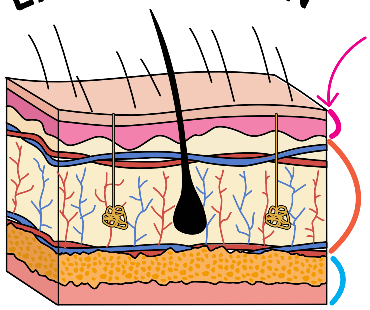
- → Adequate protein intake
- → Encourage meals
- → Adequate hydration
- → Enteral nutrition for NPO patients

### RELIEVE PRESSURE

- → Turn immobile patients q2 hours while in bed
- → Encourage mobile patients to get OOB (if approved by HCP)
- → Use preventative dressings/ devices for bony prominences

# SKIN OVERVIEW

## LAYERS OF SKIN



**EPIDERMIS**
OUTERMOST LAYER OF SKIN
Sheds dead skin cells as new ones are generated

**DERMIS**
SECOND LAYER OF SKIN
Contains blood vessels, nerves, lymph & smooth muscle

**HYPODERMIS**
INNERMOST LAYER OF SKIN
- Contains fat cells & smooth muscle
- Functions as shock absorber & heat insulator

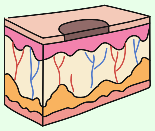
## MAIN FUNCTIONS OF THE SKIN

- → Protection against external environment
- → Temperature regulation
- → Elimination (sweat glands)
- → Synthesizes vitamin D
- → Sensation: allows the feeling of hot, cold, pressure, touch, & pain

## TYPES OF SKIN LESIONS

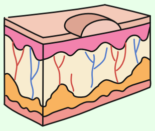
### PRIMARY

**MACULE**



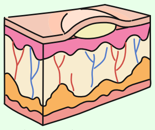
Flat discoloration of skin

**PAPULE**



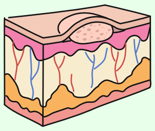
Small, solid elevation

**VESICLE**



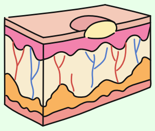
Thin, raised wall filled with fluid

**NODULE**



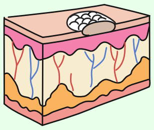
Firm, raised, deep

**PUSTULE**



Raised often with "head", filled with pus

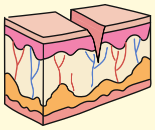
**PLAQUE**



Slightly raised, scale-like

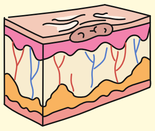
### SECONDARY

**FISSURE**



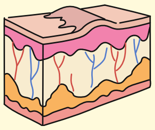
Linear crack or tear in tissue

**SCALES**



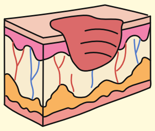
Flakes of skin layer

**SCAR**



Loss of normal tissue replaced with connective tissue

**ULCER**



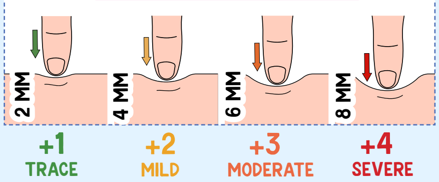
Full thickness loss of epidermis with damage into dermis

## EDEMA

Build up of fluid in the tissues

**CAN BE PITTING OR NON–PITTING**

GRADING FOR PITTING:



**PITTING EDEMA** is when pressure is applied to a certain area of the body & it leaves an indent or a "pit"

**MOST COMMON AREAS:**
- Legs
- Ankles
- Feet

## SKIN COLOR ABNORMALITIES

**PALLOR: PALE**
- Lack of blood flow

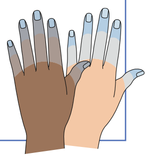
**JAUNDICE: YELLOW/ORANGE**
- Liver disease or ↑ billirubin

**ERYTHEMA: RED/ PINK**
- Inflammation,local vasodilation, hyperthermia

**CYANOSIS: BLUE**
- Lack of oxygen

May appear gray or unnoticeable in dark skinned patients

**MAKE SURE TO CHECK MUCOUS MEMBRANES!**

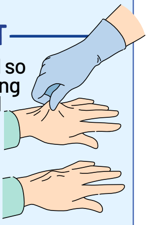


## SKIN TURGOR

Measure of skin elasticity

### SKIN TURGOR TEST

Pinch skin on back of hand so it tents up and time how long it takes to return to normal



NORMAL: <2 SECONDS

DECREASED: >2 SECONDS

Skin that stays elevated >2 seconds means poor skin turgor which could indicate **DEHYDRATION**

**NOT a reliable test in the elderly**

Elderly patients have natural loss of skin elasticity as they age which could cause poor skin turgor

Need to include other assessments to test for dehydration

# AMBULATION DEVICES

## ASSESSING MOBILITY STATUS

### FUNCTIONAL MOBILITY

Ability a person has to move around in their environment

**INCLUDES:**

**BED MOBILITY**

- Ability of patient to move around in bed
- Includes moving from lying to sitting & sitting to lying

**TRANSFERRING**

- Action of patient moving from one surface to another
- Includes moving from bed to chair & from one chair to another

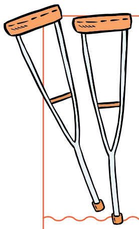
**AMBULATION**

- Ability of patient to walk
- Includes assistance from another person or assistive devices

### ASSISTANCE REQUIREMENTS

| | |
|---|---|
| **INDEPENDENT** | Patient can safely perform functional tasks on their own |
| **STANDBY ASSIST** | Nurse does not touch patient but remains close for safety if they lose balance |
| **CONTACT GUARD** | Nurse places hands on patient to help balance (no other assistance needed) |
| **MINIMUM** | Patient can perform %75 of mobility tasks; caregiver assists with %25 |
| **MODERATE** | Patient can perform %50 of mobility tasks; caregiver assists with %50 |
| **MAXIMUM** | Patient can perform %25 of mobility tasks; caregiver assists with %75 |
| **DEPENDENT** | Patient unable to help at all or perform any mobiltiy tasks; needs full support |

## TYPES OF ASSISTIVE DEVICES



### CRUTCHES

Assistive devices that allows patient to transfer weight from lower body to upper body

**HOW TO KNOW THEY FIT**

- Underarm pad should sit 2 inches below armpit when at rest
- Elbows should be bent at 30 degrees when hands on grips

**GOING UPSTAIRS**

① Move **GOOD** leg first
② Then move **BAD** leg

**GOING DOWNSTAIRS**

① Move **BAD** leg first
② Then move **GOOD** leg

**REMEMBER:** GOOD= UP BAD= DOWN

### TYPES OF GAITS

**TWO-POINT GAIT**

- Moves **INJURED** side's crutch at same time as **NON-INJURED** leg
- Moves **NON-INJURED** side's crutch at same time as **INJURED** leg

① Move right crutch + left leg
② Move left crutch + right leg

**THREE-POINT GAIT**

- Injured leg does NOT touch ground
- BOTH crutches and **INJURED** leg move forward together, then move **NON-INJURED** leg

① Move both crutches + injured leg
② Move non-injured leg

MOST SUPPORT

**FOUR-POINT GAIT**

- Moves **INJURED** side's crutch then moves **NON-INJURED** leg
- Moves **NON-INJURED** side's crutch then moves **INJURED** leg

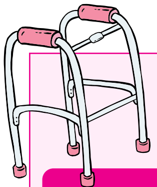
① Move right crutch
② Move left leg
③ Move left crutch
④ Move right leg

**SWING TO GAIT**

① Move both crutches forward
② Swing both legs forward to same point as crutches

**SWING THROUGH GAIT**

① Move both crutches forward
② Swing both legs forward past crutches



### WALKER

Assistive device for patients with poor balance, mobility, or that tire easily

**GAIT**

① Lift + move walker forward
② Move **WEAK** leg forward
③ Put weight on hand grips with hands
④ Move **STRONG** side forward

ALL 4 POINTS MUST TOUCH GROUND!

**HOW TO KNOW IT FITS**

- Height should be level with wrists when arms by sides
- Elbows should be bent at 30 degrees when hands on grips

**GETTING UP**

- Do NOT use walker to get up
- Place hands on chair arms to push up with strong leg
- Once standing, then grip walker

**SITTING DOWN**

- Back up to chair so backs of legs touch chair while holding walker
- Bend strong leg and slightly extend weak leg while feeling for chair arms

### CANE

Provides balance & support for patients that have a weaker side

**HOW TO KNOW IT FITS**

- Top of cane should be level with greater trochanter or wrist
- Elbow should be bent 15-30 degrees while gripping

**GAIT**

① Hold cane on strong side
② Place cane 6-10 inches forward
③ Move cane & **WEAK** side forward
④ Move **STRONG** side forward

Nurse should stand on patient's **WEAK SIDE** during ambulation

**GOING UPSTAIRS**

① Move **GOOD** leg first
② Then move **BAD** leg

**GOING DOWNSTAIRS**

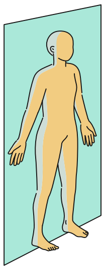
① Move **BAD** leg first
② Then move **GOOD** leg

**USING A FOUR-PRONGED CANE:**

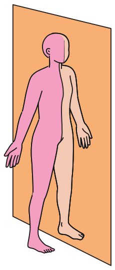
- Rounded side should face away from body
- Two points of contact should be on ground at all times

# PATIENT POSITIONING

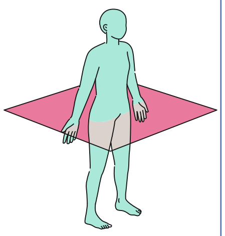
## ANATOMICAL PLANES



**FRONTAL**
Divides front & back planes



**SAGITTAL**
Divides right & left planes



**TRANSVERSE**
Divides top & bottom planes

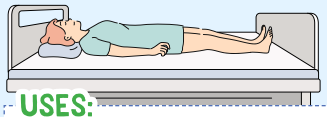
## DIRECTIONAL TERMS

**SUPERIOR (CRANIAL):** Above
**INFERIOR (CAUDAL):** Below
**ANTERIOR (VENTRAL):** Front
**POSTERIOR (DORSAL):** Back
**DISTAL:** Away from
**PROXIMAL:** Closest to
**SUPERFICIAL (EXTERNAL):** Nearest to surface
**DEEP (INTERNAL):** Away from the surface
**MEDIAL:** Towards the midline of body
**LATERAL:** Away from the midline of body
**INTERMEDIATE:** Between two structures

## POSITIONING

### SUPINE (DORSAL RECUMBANT)

Patient lying flat on back

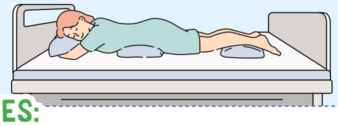


**MONITOR FOR SKIN BREAKDOWN**

**USES:**
- Rest
- Abdominal and chest procedures
- Physical assessment

### PRONE

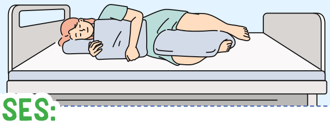
Patient lying on abdomen with head turned to one side



**USES:**
- Patients in ARDS
- Promote drainage after mouth or neck procedures

### LATERAL (SIDE LYING)

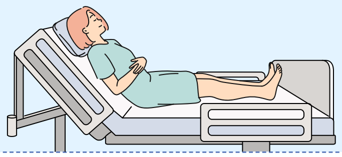
Patient lying on one side with one leg flexed + pillow between legs for comfort



**USES:**
- Rest
- Relieve pressure from sacrum & heels

### FOWLER'S (SEMI-SITTING)

Head elevated between 15-60 degrees

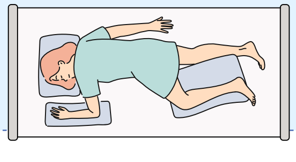


Head of bed of ventilated patients or patients receiving tube feeds must be at least 30 degrees to prevent **ASPIRATION**

| **LOW FOWLER'S** | **SEMI FOWLER'S** | **HIGH FOWLER'S** |
|---|---|---|
| **15-30 degrees** | **30-45 degrees** | **60-90 degrees** |
| **USES:** | **USES:** | **USES:** |
| → Reduce lower back pain | → Prevent aspiration | → Eating & drinking |
| → After procedure | → Lung expansion | → Bedside chest x-rays |
| → Drawing blood | → Reduce nausea | → Difficulty breathing |

### SIMS (SEMI-PRONE)

Patient lying halfway between side-lying & prone with one arm & leg flexed

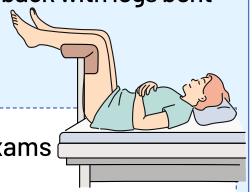


**USES:**
- Administering enemas
- Sleeping position for pregnant women

**PILLOW PLACEMENT**
- ★ Under head
- ★ Under upper arm (to prevent internal rotation)
- ★ Between legs

### LITHOTOMY

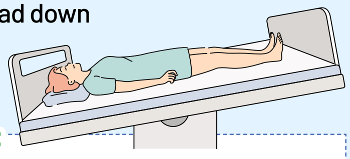
Patient lying flat on back with legs bent and open



**USES:**
- Gynecological exams
- Childbirth
- Urological procedures

### TRENDELENBURG

Patient flat on back with bed tilted with head down

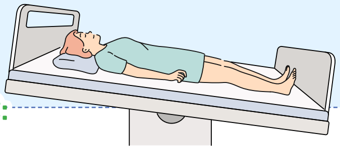


**USES:**
- Placing central lines
- Lower abdominal surgeries

Previously used to treat acute hypotension but due to adverse effects is **not recommended**

### REVERSE TRENDELENBURG

Patient lying flat on back with bed tilted with feet down



**USES:**
- Reduce esophageal reflux
- Promote gastric emptying
- Lung expansion in obese patients

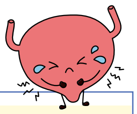
# URINARY ELIMINATION

## FACTORS AFFECTING URINARY ELIMINATION

- → Age
- → Environmental factors
- → Medication
- → Cognition
- → Fluid balance
- → Surgical/ Dx procedures
- → Medical conditions
- → Body positioning

**INCONTINENCE DEFINITION:** Involuntary loss of urine

CAN BE TEMPORARY OR PERMANENT & CAN AFFECT ALL AGES!



## TYPES OF URINARY INCONTINENCE

**STRESS:** Due to ↑ pressure (sneezing or coughing) & weak pelvic floor muscles

**REFLEX:** Bladder contracting without warning

**FUNCTIONAL:** Impaired mobility or cognition leading to untimely urination

**OVERFLOW:** Unexpected leakage of urine due to overfilled bladder

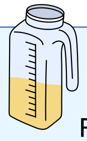
**TRANSIENT:** Temporary leakage of urine due to situation or condition

**URGE:** Inability to make it to bathroom in time due to overactive detrusor muscle

## URINE ELIMINATION & COLLECTION

### NON-INVASIVE

ALWAYS ATTEMPT FIRST BEFORE MOVING TO MORE INVASIVE MEASURES



**BEDPAN/ URINAL**

Requires patient to be coherent of when needing to relieve bladder

**EXTERNAL CATHETER**

- ▸ PUREWICK
- ▸ CONDOM CATHETER

Devices that lay on the outside of the genitalia that are connected to collection systems

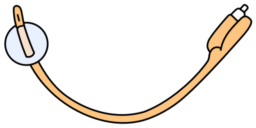
### INVASIVE (CATHETERS)

**INTERMITTENT STRAIGHT CATHETERIZATION**

Temporarily inserting a catheter inside the bladder to drain urine, then removing once drained

PROCEDURE MUST BE DONE STERILE

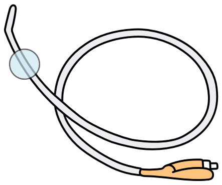
**INDWELLING FOLEY CATHETER**



Standard catheter that stays in the bladder to collect urine; used on average up to two weeks.

Prolonged catheter use increases risk of **INFECTION**

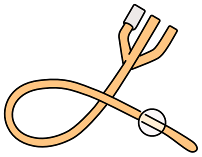
**COUDE CATHETER**



Catheter with a curved tip used for patients with obstructions or challenging anatomy

OFTEN USED IN PATIENTS WITH ENLARGED PROSTATE

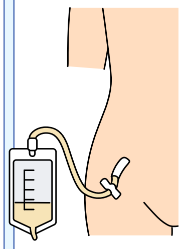
**THREE-WAY CATHETER**



Catheter with an extra tube that allows for continuous irrigation

OFTEN USED IN PATIENTS AFTER BLADDER SX

**SUPRAPUBIC CATHETER**



Catheter inserted directly into the bladder via the abdominal wall

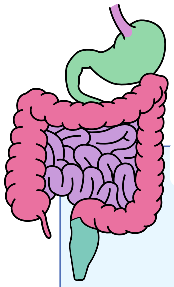
Used in patients in need of **LONG TERM URINARY MANAGEMENT**

- ▸ Neurogenic bladder
- ▸ Patients unable to self-catheterize

## CATHETER CARE

- → Always keep drainage bag below level of bladder
- → Check for kinks and sediment in tubing (will cause bladder distention if blocked)
- → Catheter insertion is always a sterile procedure
- → Clean site daily with mild soap and water
- → Remove catheter as soon as possible to reduce risk of infection
- → Ensure date & time of insertion is properly documented

# BOWEL ELIMINATION



## FACTORS AFFECTING BOWEL ELIMINATION

- → Privacy
- → Personal habits
- → Age
- → Diet
- → Exercise and activity
- → Fluids
- → Medications
- → Position

## PROMOTION FOR HEALTHY BOWEL ELIMINATION

- → Encourage adequate fluid intake
- → Physical activity
- → Encourage adequate fiber intake

"**NORMAL**" varies between patients & can range from 3 times per **DAY** to 3 times per **WEEK** on average

## DIAGNOSTICS

### GUIAC TEST

Stool sample to test for blood in the stool

### COLONOSCOPY

Endoscope inserted through anus to visualize colon and small bowel

### SIGMOIDOSCOPY

Endoscope inserted through anus to visualize sigmoid colon

### (EGD) ESOPHAGOGASTRODUODENOSCOPY

Endoscope inserted through mouth to visualize esophagus, upper GI tract, and duodenum

### SMALL BOWEL SERIES

X-rays taken after ingestion of contrast agent barium sulfate to obtain clear picture of small bowel

## DEVELOPMENTAL CONSIDERATIONS

**INFANTS**
- → Stool characteristics change depending on formula or breastfeeding

**TODDLERS**
- → Become potty trained between 1.5-3 years old

**CHILDREN TO ADULTHOOD**
- → Bowel patterns vary in quantity & frequency

**OLDER ADULTS**
- → Decreased peristalsis
- → Constipation can be chronic problem

## CONSTIPATION

Decrease in normal frequency possibly accompanied by difficulty passing stool or hard/dry stool

**IF LEFT UNTREATED CAN LEAD TO:**

- ▸ Fecal impaction
- ▸ Bowel obstruction
- ▸ Perforation of bowel

### RISK FACTORS

- → Bedrest
- → Fluid restriction
- → Depression
- → CNS disease
- → Painful lesions
- → Opioids
- → Medications
  - ▸ Anticholinergics
  - ▸ Iron supplements
  - ▸ Anticonvulsants

### VALSALVA MANEUVER

- → Act of holding breath & bearing down
- → Stimulates vagus nerve & slows heart rate

**ALSO CAUSED BY STRAINING FROM CONSTIPATION**

↳ Increases intrathoracic pressure & ICP

In high risk patients can lead to **BRAIN INJURY**, **BRADYCARDIA**, or even **CARDIAC ARREST** & should be **avoided**

## DIARRHEA

Increase in normal frequency, water content, and volume of waste

**IF LEFT UNTREATED CAN LEAD TO:**

- ▸ Electrolyte imbalances
- ▸ Dehydration

### RISK FACTORS

- → Anxiety & stress
- → Laxative abuse
- → Tube feedings
- → IBD
- → Alcohol abuse
- → Food intolerances
- → Medications
  - ▸ Antibiotics → MOST COMMON CAUSE OF C.DIFF
  - ▸ Chemo
  - ▸ Antidepressants

# NUTRITION BASICS

## TYPES OF NUTRIENTS

### MACRONUTRIENTS

Required for **energy**

NEED LARGE AMOUNTS

**INCLUDES:**

- Carbohydrates
- Proteins
- Fats

### MICRONUTRIENTS

Required for **functioning**

NEED SMALL AMOUNTS

**INCLUDES:**

- Vitamins
- Minerals
  - Includes **electrolytes**

## BMI CHART

| BMI CHART | |
|---|---|
| UNDERWEIGHT | <18.5 |
| HEALTHY WEIGHT | 18.5–24.9 |
| OVERWEIGHT | 25–29.9 |
| OBESE | 30–34.9 |
| SEVERELY OBESE | 35–39.9 |
| MORBIDLY OBESE | ≥ 40 |

## NUTRIENT FUNCTIONS

**KCAL= KILOCALORIE (CALORIE)**
Amount of heat required to raise temp of 1 kg of water 1 degree celcius

### MACRONUTRIENTS

#### CARBOHYDRATES

Main source of energy for body

**4 KCAL/ 1 G CARB**

**RECOMMENDED INTAKE:**
45%-65% of total calories/ day

#### PROTEIN

- Growth, maintenance & repair
- Immune support & fluid balance

**4 KCAL/ 1 G PROTEIN**

**RECOMMENDED INTAKE:**
10%-35% of total calories/ day

#### FATS

- Energy storage, insulation & protection
- Absorbtion of fat soluble vitamins

**9 KCAL/ 1 G FAT**

**RECOMMENDED INTAKE:**
20%-35% of total calories/ day

### MICRONUTRIENTS

#### VITAMINS

Organic molecules that aid in cell function, growth & development

##### WATER-SOLUBLE VITAMINS

Vitamins that dissolve in water

- → Carried in tissues & not stored long term
- → Excreted in urine
- → Require daily intake through diet and/or supplementation
- → Low risk of toxicity

**INCLUDES:**
All B Vitamins & Vitamin C

##### FAT-SOLUBLE VITAMINS

Vitamins that dissolve in fat

- → Stored in fatty tissue & liver for longer periods of time
- → Require intake of fats to be absorbed
- → Higher risk of toxicity

**INCLUDES:**
Vitamins **A, D, E & K**
↳ **THINK A FAT DECK OF CARDS**

#### MINERALS

Inorganic molecules that aid in hormone & enzyme production + cardiac, neuro, bone & muscle functioning

##### MACROMINERALS (ELECTROLYTES)

Needed in larger amounts

**Play key role in cardiac, neuro, bone & muscle functioning**

**INCLUDES:**

- Potassium
- Sodium
- Calcium
- Magnesium
- Phosphorous
- Chloride
- Sulfur

##### TRACE MINERALS

Needed in smaller amounts

Act as catalysts to enzymes & generate metabolic functioning

**INCLUDES:**

- Iron
- Zinc
- Selenium
- Copper
- Iodine
- Manganese
- Flouride
- Molybdenum
- Chromium
- Cobalt
- Boron

**+ MANY MORE!**

# NUTRITION BASICS

## MACRONUTRIENTS

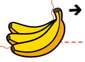
## CARBOHYDRATES

**FUNCTION:**
Primary source of energy + control blood glucose levels & insulin metabolism

### SIMPLE CARBS

- ★ Easily digested
- ★ Provide quick energy
- ★ Cause blood sugar to rise quickly

**FOUND IN:**
- ▸ Honey
- ▸ Fruits
- ▸ Milk



#### MONOSACCHARIDES

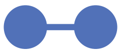
Simplest forms of carbs

← Contain **ONE** sugar molecule (**MONO** MEANS **ONE**)

**EXAMPLES:**
- → Glucose (dextrose)
- → Fructose (found in fruit)
- → Galactose (usually with other sugars)

#### DISACCHARIDES

Contain 2 monosaccharides



← Contain **TWO** sugar molecules (**DI** MEANS **TWO**)

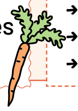
**EXAMPLES:**
- → Sucrose (table sugar)
- → Lactose (milk sugar)
- → Maltose (malt sugar)

**FOUND IN:**
- ▸ Sweets & candy
- ▸ Beer
- ▸ Dairy products

### COMPLEX CARBS

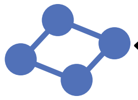
- ★ Take longer to digest
- ★ Provide longer, sustained energy
- ★ Cause blood sugar to rise slowly

**FOUND IN:**
- → Grains
- → Vegetables
- → Beans



#### POLYSACCHARIDES

Most abundant form of carbs



← Contain **MULTIPLE** sugar molecules (**POLY** MEANS **MANY**)

**EXAMPLES:**
- → Glycogen
- → Starch (found in starchy veg + grains)
- → Cellulose (found in plants)

Stored in liver & muscles & later released into the bloodstream through **GLYCOGENOLYSIS**

**GLYCO**= Sugar
**LYSIS**= Breakdown

When energy stores are depleted, blood sugar levels decrease & glycogenolysis is triggered

#### FIBER

Complex carbs not absorbed by the body

**SOLUBLE:** dissolves in fluids
- ▸ Attracts water to slow digestion
- ▸ Regulates blood sugar

**INSOLUBLE:** does **not** dissolve
- ▸ Adds bulk to stool
- ▸ Promotes bowel motility

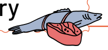
## PROTEIN

**FUNCTION:**
Essential nutrients made up of amino acids that aid in growth & development

### COMPLETE PROTEINS

Contain all 9 essential amino acids

**FOUND IN:**
- → Meat
- → Dairy
- → Fish
- → Soy products
- → Eggs
- → Poultry



### INCOMPLETE PROTEINS

Do **not** contain all 9 essential amino acids

**FOUND IN:**
- → Nuts
- → Seeds
- → Legumes
- → Whole grains
- → Vegetables

Incomplete proteins can be paired with other foods to make a **complementary protein**

**EXAMPLES:**
- → Rice & beans
- → Peanut butter on wheat toast
- → Hummus & pita bread

## FATS (LIPIDS)

**FUNCTION:**
Main source of stored energy & aid in hormone synthesis & cell structure

"GOOD" FAT

### UNSATURATED

Type of triglyceride that is **liquid** at room temperature

#### MONOUNSATURATED

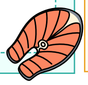
- → Help lower LDL levels
- → Aid in cell maintenance

**FOUND IN:**
- ▸ Olive oil
- ▸ Avocados
- ▸ Nuts

#### POLYUNSATURATED

Include omega-3 & omega-6 fatty acids which are crucial for brain function & cell growth

**FOUND IN:**
- ▸ Seeds
- ▸ Fish
- ▸ Plant oils



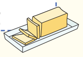
"BAD" FAT

### SATURATED

Type of triglyceride that is **solid** at room temperature

- → Increase LDL levels
- → Consumed in excess have been linked to increased risk of heart disease & stroke

**FOUND IN:**
- ▸ Butter
- ▸ Cheese
- ▸ Red meat



Recommended to consume no more than 6% OF TOTAL DAILY INTAKE OF CALORIES

↳ Limit high-fat dairy, tropical oils & choose leaner meats

"WORST" FAT

### TRANS

Type of unsat. fat produced through **hydrogenation**

- → Increase LDL levels
- → Lowers HDL
- → Consumed in excess have been linked to increased risk of heart disease & stroke

**FOUND IN:**
- ▸ Fried foods
- ▸ Chips
- ▸ Cakes

Recommended to limit TO 1% OF TOTAL DAILY CALORIES

↳ Avoid processed foods

### CHOLESTEROL

Waxy-like substance produced by the liver

#### LDL

**BAD** cholesterol

Think **L** for **LOUSY**

WANT LOUSY LEVELS LOW

#### HDL

**GOOD** cholesterol

Think **H** for **HAPPY**

WANT HAPPY LEVELS HIGH

Recommended intake
<300MG/ DAY

<200MG for patients high risk of heart disease

# NUTRITION BASICS

## MICRONUTRIENTS

## VITAMINS

### WATER SOLUBLE

| VITAMIN | DEFICIENCY CAN CAUSE: |
|---|---|
| **B1**<br>**THIAMINE** | → Wernicke-Korsakoff syndrome<br>→ Beriberi |
| **B2**<br>**RIBOFLAVIN** | **Cheilosis**<br>Dry, swollen lips & cracks in corners of mouth |
| **B3**<br>**NIACIN** | **Pallagra**<br>Can cause **D**iarrhea, **D**ermatitis, & **D**ementia<br>3 D'S |
| **B6**<br>**PYRIDOXINE** | → Peripheral neuropathy<br>→ Anemia |
| **B9**<br>**FOLIC ACID** | → Fetal neural tube defects<br>→ Megaloblastic anemia |
| **B12**<br>**COBALAMINE** | → Pernicious anemia<br>→ Peripheral neuropathy |
| **VITAMIN C** | **Scurvy**<br>Swollen & bleeding gums, tooth loss, bruising & weakness |

### FAT-SOLUBLE

| VITAMIN | FUNCTION | SOURCES |
|---|---|---|
| **VITAMIN A**<br>Deficiency can cause **NIGHT BLINDNESS** | → Vision<br>→ Immune function<br>→ Cell growth | → Orange & yellow vegetables & fruits<br>→ Dairy<br>→ Fish |
| **VITAMIN D**<br>Deficiency can cause **RICKETS** or **OSTEOMALACIA** | → Calcium absorption<br>→ Bone growth<br>→ Immune function | → Sunlight<br>→ Fatty fish<br>→ Fortified foods<br>→ Eggs |
| **VITAMIN E**<br>Deficiency can cause **ANEMIA & ATAXIA** | → Antioxidant<br>→ Protects cells<br>→ Immune function | → Leafy greens<br>→ Seeds<br>→ Nuts<br>→ Vegetable oils |
| **VITAMIN K**<br>Deficiency can cause ↑ **RISK OF BLEEDING** | → Blood clotting<br>→ Bone maintenance<br>→ Tissue health | → Leafy greens<br>→ Soybeans<br>→ Beef liver<br>→ Eggs |

**REQUIRE FATS TO BE ABSORBED**

**HIGHER RISK OF TOXICITY BECAUSE STORED IN FAT!**

## MINERALS

### MACROMINERALS (ELECTROLYTES)

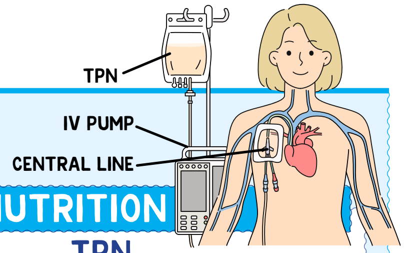
| ELECTROLYTE | FUNCTION | SOURCES |
|---|---|---|
| **SODIUM** | → Fluid volume<br>→ Muscle contraction<br>→ Nerve impulses | → Salt |
| **POTASSIUM** | → Cardiac function<br>→ Muscle contraction<br>→ Fluid volume | → Bananas<br>→ Potatoes<br>→ Avocados<br>→ Beans |
| **CALCIUM** | → Bone health<br>→ Blood clotting<br>→ Muscle contraction | → Leafy greens<br>→ Soybeans<br>→ Dairy<br>→ Fish |
| **MAGNESIUM** | → Muscle relaxation<br>→ Nerve function<br>→ Heart contractility | → Dark chocolate<br>→ Nuts<br>→ Leafy greens<br>→ Whole grains |
| **PHOSPHATE** | → Bone formation<br>→ Energy metabolism<br>→ Nerve function | → Meat<br>→ Fish<br>→ Dairy<br>→ Pumpkin |

### TRACE MINERALS

| MINERAL | FUNCTION | SOURCES |
|---|---|---|
| **IRON** | Essential part of hemoglobin | → Meat<br>→ Seafood<br>→ Grains + legumes |
| **ZINC** | Immune support & metabolic function | → Shellfish<br>→ Meat & poultry<br>→ Legumes |
| **IODINE** | Thyroid function & metabolism | → Seaweed<br>→ Seafood<br>→ Iodized salt |
| **FLUORIDE** | Prevents dental carries & decay | → Toothpaste<br>→ Fluoridated water<br>→ Grapes & raisins |
| **CHLORIDE** | Fluid balance & acid-base balance | → Table salt<br>→ Whole grains<br>→ Tomatoes |
| **COPPER** | Red blood cell & collagen production | → Beef liver<br>→ Oysters<br>→ Mushrooms |
| **SELENIUM** | Antioxidant & thyroid metabolism | → Brazil nuts<br>→ Beef & pork<br>→ Seafoods |

# ENTERAL VS. PARENTERAL NUTRITION

## PARENTERAL NUTRITION



Nutrition provided **intravenously** instead of through the digestive system

- ★ Used to prevent malnutrition
- ★ For patients unable to eat or malabsorption
- ★ Nutrients delivered directly into bloodstream

### USED FOR PATIENTS WITH:

- → Prolonged NPO status
- → Small bowel obstruction
- → Paralytic ileus
- → Enteritis

**HIGHER RISK OF SEPSIS THAN ENTERAL FEEDING**

### TYPES OF PARENTERAL NUTRITION

#### PPN

**PERIPHERAL PARENTERAL NUTRITION**

- → Only provides partial nutrient needs
- → Can be infused through peripheral line
- → For short term use only

At risk for **THROMBOPHLEBITIS**

#### TPN

**TOTAL PARENTERAL NUTRITION**

- → Provides full nutrient needs
- → Must be infused through central line
- → For more long-term use

At risk for **CENTRAL LINE INFECTION**

### NURSING CARE

- ▶ Monitor site for infiltration or leakage
- ▶ Change bag & IV tubing every 24 hours
- ▶ TPN that contains lipids requires micron filter
- ▶ Monitor electrolytes, glucose, I& O, & daily weights

⚠ **CANNOT ADMINISTER OTHER FLUIDS OR MEDS IN SAME LINE AS TPN OR PPN**

## ENTERAL NUTRITION

Nutrition provided directly through the **gastrointestinal tract**

- ★ Nutrition provided to GI tract without patient eating & swallowing
- ★ Helps maintain gastric motility
- ★ Indicated for patients who need nutritional supplementation with functioning GI tract

### USED FOR PATIENTS WITH:

- → Stroke
- → Mechanically ventilated
- → Esophageal obstruction
- → Severe burns

**HIGHER RISK OF ASPIRATION THAN PARENTERAL FEEDING**

### ROUTES

#### NASOGASTRIC/ OROGASTRIC TUBE

Tube that passes through one of the nostrils or mouth, down the throat & into the stomach

#### PEG TUBE

**PERCUTANEOUS ENDOSCOPIC GASTRONOMY**

Tube inserted through the abdomen directly into the stomach

#### J TUBE

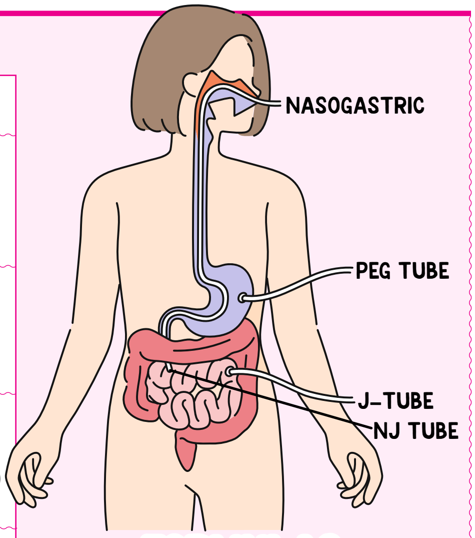
**JEJUNOSTOMY**

Tube inserted through the abdomen directly into the small intestine (jejunum)

#### NJ TUBE

**NASOJEJUNAL TUBE**

Tube inserted through one of the nostrils, down the throat & into the jejunum



### FORMULAS

#### POLYMETRIC

Contains a blend of proteins, carbohydrates and fats, as well as a variety of essential vitamins & minerals

#### ELEMENTAL

Contains individual amino acids and simple sugars, rather than complete proteins and complex carbohydrates

→ **FOR PATIENTS WHO HAVE A HARDER TIME DIGESTING & ABSORBING NUTRIENTS**

### NURSING CARE

- → Check tube feeding residual every 4 hours (or per hospital policy)
  - ▶ Return any residual back to stomach; DO NOT discard unless specified by MD (could cause fluid & electrolyte imbalance)
  - ▶ If residual is >400, STOP feeds and tell provider (patient is at risk for aspiration)
- → Flush tube with 20-60 mL of water to prevent clogging
- → Monitor skin around site for any signs of breakdown

#### PREVENT ASPIRATION

- ▶ Keep HOB at least 30-45 degrees
- ▶ Monitor external length of NG & OG tube
- ▶ Closely monitor tube feeding residuals
- ▶ Use x-ray to verify initial placement
- ▶ Monitor bowel sounds

# OSTOMIES

**AN OSTOMY** is a surgical opening in which part of the bowel is resected through an opening in the abdominal wall forming a **stoma** for elimination to exit

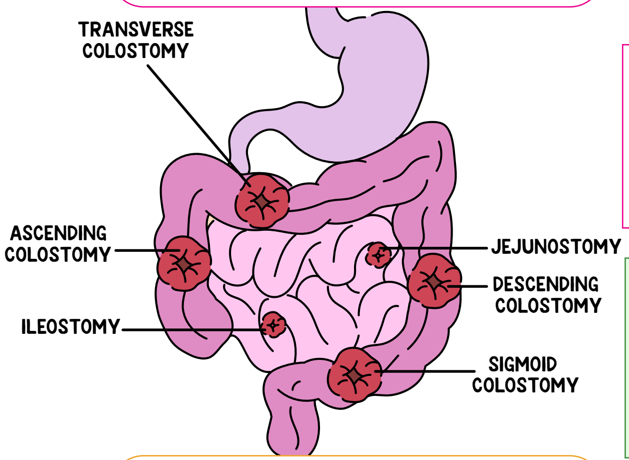
↳ Connects to external bag to collect waste which needs to be emptied regularly

**CAN BE TEMPORARY OR PERMANENT**

## POSSIBLE CAUSES

- → Diverticulitis
- → IBD
- → Colon cancer
- → Trauma to bowel or rectum
- → Obstruction
- → Bladder cancer
- → Trauma to bladder or ureters
- → Chronic infections
- → Renal calculi
- → Hemorrhagic cystitis

## STOOL DIVERSIONS



### ILEOSTOMY

Ostomy created in ileum of small intestine

**LIQUID OUTPUT:**
Elimination occurs before fluid reaches colon to mix into stool

### EDUCATION

- Low fiber diet first 6-8 weeks
- Chew foods thoroughly to make output easier
- Ileostomies will create larger or more frequent output

### COLOSTOMY

Ostomy created in colon of large intestine

**ASCENDING**
From ascending colon
LIQUIDY STOOL

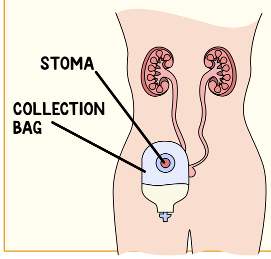
**TRANSVERSE**
From transverse colon
SEMI-FORMED STOOL

**DESCENDING**
From descending colon
SOLID & FORMED STOOL

## URINE DIVERSIONS

### UROSTOMY

Tube connected to one or both ureters that exits through the abdominal wall into a collection system



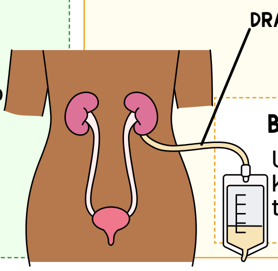
**BYPASSES THE BLADDER**
Urine stilll passes through kidneys & ureters

### EDUCATION

- Urine may appear slightly red after surgery
- Drink 8 8-ounce glasses of water/ day
- Check pouch routinely to empty- will not feel urge to urinate
- Monitor tubing for sediment or cloudiness

### NEPHROSTOMY

Tube connected to one or both kidneys that exits through the back into a collection system

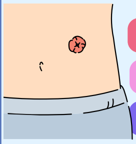


**DO NOT HAVE STOMA SITES**
Drainage tube goes directly into kidney

**BYPASSES THE URETERS**
Urine flows directly from kidney into bag- never passes through ureters or bladder

## STOMA CARE

### STOMA COLORS



| | |
|---|---|
| RED-PINK | NORMAL |
| PALE PINK | ANEMIA |
| PURPLE-BLUE | ISCHEMIA |

**STOMA NECROSIS INDICATES TISSUE DEATH**
contact PCP immediately!

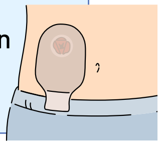
- Wash skin around stoma with warm water
- Measure stoma to ensure wafer fits properly
- Monitor around site for skin breakdown

**PROVIDE EMOTIONAL SUPPORT TO PATIENT** ♥

## POUCH CARE

- → Empty ostomy pouch when 1/3-1/2 full to reduce risk of leaks and odors
- → Change pouch system every 3-5 days
- → Bag will expand when it fills up with gas; "burp" bag by slowly letting air out
- → Avoid unnecessary bag changes as this can irritate the surrounding skin

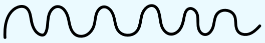
**ALERT MD IF ANY BLOOD SEEN IN POUCH**



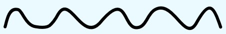
# OXYGENATION

## BREATHING PATTERNS

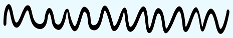
**NORMAL**
Regular & even



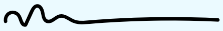
**BRADYPNEA**
Slow breathing



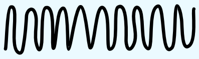
**TACHYPNEA**
Fast breathing



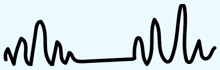
**APNEA**
Lack of breathing

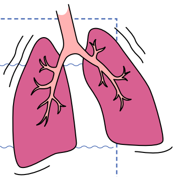


**KUSSMAUL**
Fast, deep breathing ocurring in response to metabolic acidosis



**CHEYNE-STOKES**
Deep & rapid breathing followed by apnea
(Often seen in end of life)





**DYSPNEA**
Difficulty breathing

**ORTHOPNEA**
Shortness of breath when lying flat

**DYSPNEA ON EXERTION**
Shortness of breath during physical activity

**ACCESSORY MUSCLE USE**
Using chest wall muscles to breathe, indicating increased work of breathing

## LUNG SOUNDS

| TYPE | SOUNDS LIKE: | CAUSED BY: | CONDITIONS: |
|---|---|---|---|
| **WHEEZING** | High pitched "musical flute" | Narrow airway / bronchoconstriction | ▸ Asthma<br>▸ COPD |
| **FINE CRACKLES** | High pitched crackling (rubbing hair between fingers) | Inflammation of lungs (fluid-filled alveoli) | ▸ Pneumonia<br>▸ Bronchitis<br>▸ Asthma<br>▸ Emphysema |
| **COARSE CRACKLES** | Low pitched crackling (pulling apart velcro) | | |
| **RHONCHI** | Low rattling/ rumbling (snoring) | Fluid & secretions in airway | ▸ Upper respiratory infection<br>▸ Pneumonia |
| **STRIDOR** | High pitched inspiratory whistle (seal barking) | Upper airway narrowed or obstructed | ▸ Foreign body<br>▸ Croup<br>▸ Epiglottitis |
| **PLEURAL FRICTION RUB** | Low pitched dry rubbing (Walking on creaky floor) | Pleural layers rubbing against each other from inflammation | ▸ Lung cancer<br>▸ Pneumonia<br>▸ Emphysema |

## HYPOXIA

Decreased oxygen supply to tissue and cells

### EARLY SIGNS:

- Restlessness
- Anxiety
- Tachycardia
- Tachypnea

### LATE SIGNS:

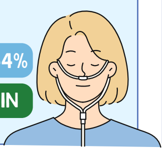
- Bradycardia
- Extreme restlessness
- Dyspnea
- Hypotension
- Cyanosis

**EMERGENCY** ⚠

## OXYGEN DELIVERY DEVICES

### NASAL CANNULA

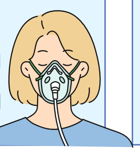
Lower oxygen requirements in stable patients



**FiO2 DELIVERY: 24–44%**
**FLOW RATE: 1–6 L/MIN**

### SIMPLE FACE MASK

For short term, moderate oxygen requirements

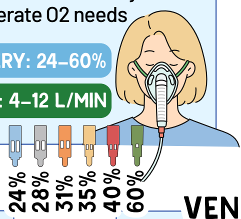


**FiO2 DELIVERY: 35–60%**
**FLOW RATE: 6–10 L/MIN**

### VENTURI MASK

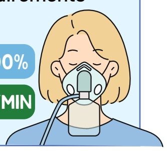
For more precise 02 delivery for low-moderate 02 needs

**FiO2 DELIVERY: 24–60%**
**FLOW RATE: 4–12 L/MIN**



### NON-REBREATHER MASK

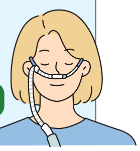
High flow oxygen requirements for emergencies



**FiO2 DELIVERY: 60–90%**
**FLOW RATE: 10–15 L/MIN**

### HIGH FLOW NASAL CANNULA

For patients with high 02 needs for longer period of time

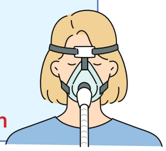


**FiO2 DELIVERY: up to 100%**
**FLOW RATE: up to 60 L/MIN**

**PROVIDES HUMIDIFICATION TO REDUCE DRYNESS**

### CPAP/ BIPAP

Patients in need of pressure support to maintain open airway

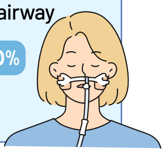


**FiO2 DELIVERY: up to 100%**

★ Can provide rate control
★ Last step before intubation

### VENTILATOR

Patients in respiratory failure & unable to support own airway



**FiO2 DELIVERY: up to 100%**
**FLOW RATE PER LIFE SUPPORT NEEDS**

# PAIN MANAGEMENT

## TYPES OF PAIN

### ACUTE

- **Temporary**; can last from 1 minute up to 6 months
- Involves SNS (fight or flight) response
- Resolves as tissue heals

EXAMPLES:
- Breaking a bone
- Appendicitis
- Labor contractions

### CHRONIC

- **Lasting longer than 6 months**
- Involves PNS response (VS can be normal)
- Can still be present after tissue has healed

#### NOCICEPTIVE

Pain caused by injury to damaged body tissue

- Nociceptors percieve painful stimuli
- Usually described as aching or throbbing

EXAMPLES:
- Stubbing toe
- Sports injury
- Spraining ankle

#### NEUROPATHIC

Pain caused by injury to damaged nerve cells

- Abnormal pain processing from nerve damage
- Usually described as burning or shooting

EXAMPLES:
- Phantom limb syndrome
- Diabetic neuropathy

#### IDIOPATHIC

Pain originating from an unknown cause

- Physical examination will have normal findings
- Can be physiological or psychological

EXAMPLES:
- Migraines
- Fibromyalgia
- TMJ

## PAIN LOCATIONS

**REFERRED**
Pain in a part of the body other than its actual source

**RADIATING**
Pain that starts in one area and spreads to another

**SOMATIC**
From bones, skin, muscle, or connective tissue

**VISCERAL**
From internal organs

## PAIN ASSESSMENT

**O NSET**
When did it begin?

**P ROVOKING/ PALLIATING FACTORS**
What brings it on? What makes it stop?

**Q UALITY**
What does it feel like?

**R ADIATION**
Does the pain spread anywhere?

**S EVERITY**
How intense is the pain? (pain scales)

**T IME**
How long does it last? Is it constant?

PATIENT'S SELF REPORT IS THE MOST RELIABLE INDICATOR!

## PAIN MANAGEMENT METHODS

### NON-PHARMACOLOGICAL

- Heat & cold
- Music
- Guided imagery
- Massage
- Meditation
- Companionship
- Accupuncture
- Distraction
- Biofeedback
- Physical Therapy

### PHARMACOLOGICAL

#### NON-OPIOID

- Acetaminophen
- NSAID's
  - Ibuprofen
  - Naproxen
- Aspirin

#### OPIOID

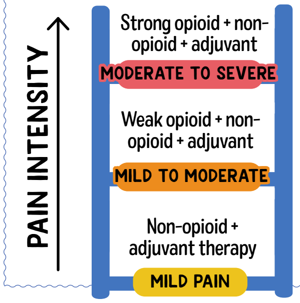
- Morphine
- Dilaudid
- Fentanyl
- Oxycodone

#### ADJUVANT

- Local anesthetics
- Antidepressants
- Anticonvulsants
- Muscle relaxants

Drugs with primary use other than pain but also have **analgesic properties**

## WHO LADDER


PAIN INTENSITY
Strong opioid + non-opioid + adjuvant
MODERATE TO SEVERE
Weak opioid + non-opioid + adjuvant
MILD TO MODERATE
Non-opioid + adjuvant therapy
MILD PAIN

Strategy developed by World Health Organization to originally provide pain relief for cancer patients, but has since been adopted for all types of patients.

| MILD PAIN | MODERATE PAIN | SEVERE PAIN |
|---|---|---|
| 1–3 | 4–6 | 7–10 |

| | | |
|---|---|---|
| STEP 1: MILD | Non- opioid & adjuvant for pain | EX: IBUPROFEN + LIDOCAINE GEL |
| STEP 2: MILD TO MODERATE | Weak opioid + non-opioid + adjuvant | EX: TRAMADOL+ IBUPROFEN + LIDOCAINE GEL |
| STEP 3: MODERATE TO SEVERE | Strong opioid + non-opioid + adjuvant | EX: MORPHINE+ IBUPROFEN + LIDOCAINE GEL |

# THERAPEUTIC COMMUNICATION

Effective communication that aides in building relationships with patients and families with verbal and non-verbal cues

## COMMUNICATION STYLES

**LOSE-WIN**

### PASSIVE

Avoiding, minimizing, or failing to express thoughts & feelings

- Denying feelings
- Prioritizes others needs
- Apologetic

EXAMPLES:

- "Whatever you want"
- "That's fine"

### ASSERTIVE

**WIN-WIN**

Expressing thoughts & feelings confidently while respecting others

- Appropriately honest
- Listens & doesn't interrupt
- Advocates for oneself

EXAMPLES:

- "I'd really like to do..."
- "I respect your opinion, but I disagree"

**LOSE-LOSE**

### PASSIVE-AGGRESSIVE

Expressing anger or frustration through indirect cues without directly expressing thoughts & feelings

- Backhanded compliments
- Denies difficult emotions
- Subtly expresses anger

EXAMPLES:

- "I guess I'll just do it myself"
- "Like I just said..."

### AGGRESSIVE

**WIN-LOSE**

Expressing thoughts & feelings forcefully with lack of consideration for others

- Inappropriately honest
- Does not listen well
- Blaming & dominating

EXAMPLES:

- "If you don't like it, too bad"
- "Can you do anything right?"

## NON-VERBAL COMMUNICATION

**OVER 90% OF COMMUNICATION IS NON-VERBAL!**

### 55% BODY LANGUAGE

- Eye contact
- Posture
- Body positioning
- Hand gesturing
- Facial expressions

### 38% VOICE TONALITY

- Pace of speech
- Pronunciation
- Pitch & tone
- Rhythm
- Volume (how loud)

## & 7% OF WHAT YOU SAY

**AVOID FALSE REASSURANCE**
"Don't worry, everything is going to be okay"

**AVOID LEADING QUESTIONS**
"You don't smoke, right?"

**AVOID "WHY" QUESTIONS**
"Why didn't you follow the treatment plan?"

**AVOID GIVING ADVICE**
"You should" or "you shouldn't" statements

## THERAPEUTIC COMMUNICATION TECHNIQUES

| TECHNIQUE | DEFINITION | EXAMPLE |
|---|---|---|
| OPEN-ENDED QUESTIONS | Statements/ questions that cannot be answered with yes/no | "Tell me more about what brought you in today." |
| RESTATING | Repeating what the patient said back to them to confirm understanding | **PATIENT:** "I didn't sleep at all."<br>**NURSE:** "You weren't able to sleep?" |
| PARAPHRASING | Restating patient words in your own words to confirm understanding | **PATIENT:** "I can't even think."<br>**NURSE:** "You're having trouble focusing?" |
| REFLECTING | Reflecting question back to patient to express thoughts & feelings | **PATIENT:** "Should I get the surgery?"<br>**NURSE:** "Well, how do you feel about it?" |

# THERMOREGULATION

## HYPERTHERMIA

### RISK FACTORS

- Infants & elderly
- Overweight
- Endocrine disorders
- Alcohol consumption
- Taking diuretics
- Chronic conditions

### TEMP >104 F

Seizures, coma or brain damage can occur

### HEAT EXHAUSTION vs. HEAT STROKE

**HEAT EXHAUSTION**

- Headache
- Cool, pale, clammy skin
- Excessive sweating
- Rapid, weak pulse
- Fatigue/ dizziness/ fainting

**TREATMENT**

- Get to cool, air conditioned place
- Drink water (if fully conscious)
- Cool shower or compress

**HEAT STROKE**

- THROBBING headache
- Skin hot and DRY
- NO sweating
- Rapid, strong pulse
- May lose consciousness

**TREATMENT**

- Move to cooler place
- Cool compress
- Do NOT give fluids

**MEDICAL EMERGENCY! CALL 911!**

### MALIGNANT HYPERTHERMIA

**EMERGENCY**

A severe reaction to anesthesia that results in dangerously high body temperature

**CAUSE**

**INHERITED GENE MUTATION**

Patients with biological family members with gene mutation are at **HIGH RISK**

**SYMPTOMS**

- Muscle rigidity
- ↑ HR
- ↓ BP
- ↑ RR
- Fever
- Dysrhythmias
- Cyanosis

**TREATMENT**

**NOTIFY ANESTHESIA & PCP IMMEDIATELY & HAVE MH CART BROUGHT TO ROOM**

- **DANTROLENE** — only effective treatment for MH
- 100% oxygen
- Fluid resuscitation
- Strict I & O
- Monitor VS & ECG
- Correct electrolytes
- Cooling blanket
- Ice packs

## HYPOTHERMIA

### RISK FACTORS

- Infants & elderly
- Surgical patients receiving anesthesia
- Low body fat %
- Chronic conditions
- Alcohol consumption

### STAGES OF HYPOTHERMIA

**MILD** 32C–35C 89.6F– 95F

- Shivering
- Loss of judgment
- Slurred speech
- Ataxia

**MODERATE** 28C–32C 82.4F– 89.6F

- Stuporous
- Shivering stops
- Hypo-reflexia
- ↓HR and ↓RR

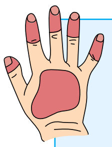
**SEVERE** < 28C/ 82.4F

- Unconscious
- High risk for V-Fib
- Unreactive/ fixed pupils

**NO PULSE! START CPR**

## COLD INJURIES

### FROST NIP vs. FROST BITE



**FROST NIP**

**MILD FORM OF FROSTBITE**

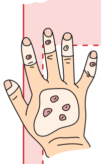
- Only skin freezes
- Skin red, soft to touch
- Numbness, tingling, burning, itching

**TREATMENT**

- Remove from cold & go to warm area
- Remove wet clothing
- Place chilled parts in warm water for 20-30 minutes until sensation returns

**FROST BITE**

Freezing & crystallization of interstitial fluids

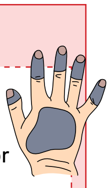


**SUPERFICIAL FROSTBITE**

- Skin pale, blue, or red
- Hard, waxy appearance
- Warm and swollen
- Fluid-filled blisters may appear 12-36 hours after rewarming

**TREATMENT**

- NO pressure to site
  - Clothing & blankets
  - No occlusive dressings on wounds
  - No rubbing or massaging



**DEEP FROSTBITE**

- Skin white or bluish-gray
- Loss of sensation; muscles or joints may no longer work
- Blood filled blisters may form after rewarming

**CAN LEAD TO GANGRENE**

**TREATMENT**

- Warm whirlpool soak
- Elevate affected area
- Escharotomy or fasciotomy may be necessary depending on severity

# PERIOPERATIVE CARE

## PERIOPERATIVE PHASES

### PREOPERATIVE

Time from when **decision for surgical intervention is made** to when patient is **transferred to operating room table**

- Patient informed of need for surgery
- Makes decision to have procedure
- Prep time may be long or very fast depending on if elective or emergent procedure

**NURSE'S FOCUS:**

- Support
- Teaching
- Procedure prep

### INTRAOPERATIVE

Time from when patient is **transferred from operating room table** to when they are **admitted to the PACU**

- Patient monitored, sedated, prepped, draped, & procedure performed
- **Time out is performed**
- Transferred to PACU after procedure

**NURSE'S FOCUS:**

- Safety
- Infection prevention
- Physical & emotional comfort

### POSTOPERATIVE

Time from when patient is **admitted to the PACU** and ends after **follow-up evaluation**

- Patient waking up from anesthesia
- Close 1:1 monitoring in immediate phase
- Patient discharged home or transferred to unit or facility

**NURSE'S FOCUS:**

- ABC's
- Safety
- Pain management

## NURSE RESPONSIBILITIES

### PREOPERATIVE

- Admission assessment
- Health and medication history
- Check allergies
- Vital signs
- Patients without catheter must void before surgery
- Make sure consent is signed

### INTRAOPERATIVE

**ROLES**

- Circulating nurse
- Scrub nurse/ tech
- Surgeon
- Surgical Assistant
- Anesthesiologist

**CIRCULATING NURSE**

NOT STERILE

- Management of all sterile equipment
- Patient assessment during procedure
- Assisting anesthesia team
- Documentation of interventions

**SCRUB NURSE**

STERILE

- Scrubbed in for entire procedure
- Maintains sterility throughout procedure
- Does instrument & sponge count
- Preps & passes instruments to surgeon

Must be done before **EVERY PROCEDURE**

**TIME OUT**

Brief pause with entire surgical team to clarify correct information to avoid harm to patient

- ✓ **RIGHT** patient
- ✓ **RIGHT** procedure
- ✓ **RIGHT** site
- ✓ **RIGHT** markings

### POSTOPERATIVE

- q1-q15 min assessments during initial phase
  - Vital signs & respiratory effort
  - Level of conciousness
  - Muscle strength
- Monitor airway
- Assess & manage pain
- Educate patients being discharged home

## TYPES OF SURGERY

| TYPE | URGENCY | EXAMPLE |
|---|---|---|
| **ELECTIVE** | Not essential to preserve patient's current health | Tonsillectomy |
| **URGENT** | Must be done within short time frame to preserve health | Appendectomy |
| **REQUIRED** | Must be done at some point to retain quality of life | Kidney stone removal |
| **EMERGENT** | Must be done immediately to preserve life, tissue, or function | Gunshot wound |

## SURGERY CLASSES

### MINOR

Usually superficial and does not require penetration of body cavity

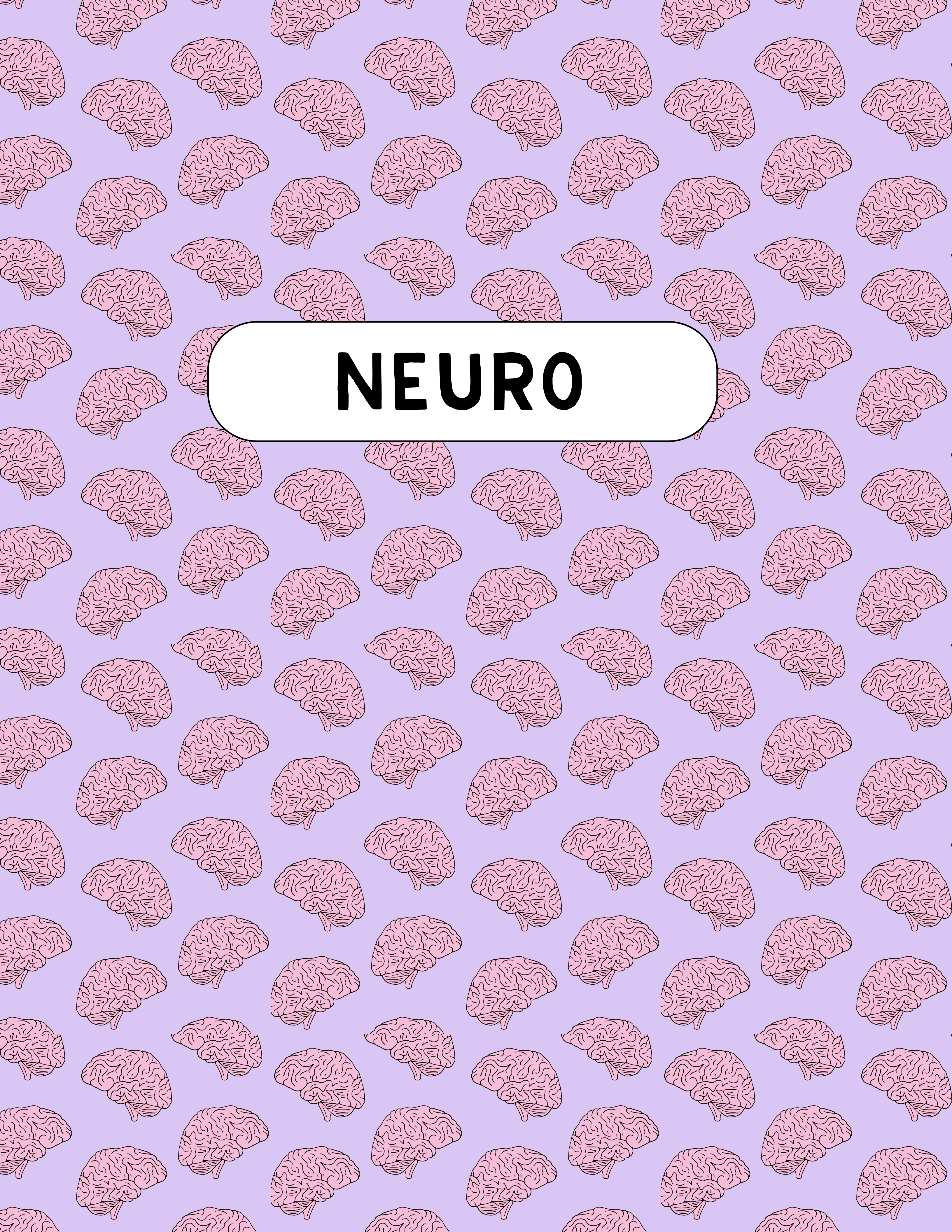
- No anesthesia or assisted breathing involved
- Short in duration
- Low risk of complications

### MAJOR

Extensive, invasive, and requires overnight or extended stay in hospital

- Anesthesia/assisted breathing usually required
- Involves major body organs/ high risk situations
- Greater risk for post-op complications

# NEURO



# NERVOUS SYSTEM OVERVIEW

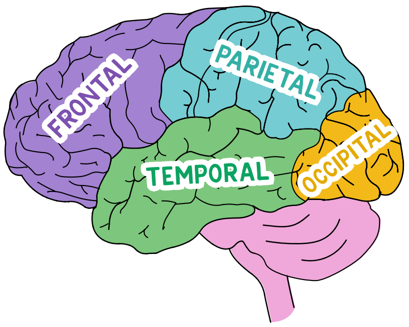
**THE NERVOUS SYSTEM IS BROKEN DOWN INTO TWO PARTS:**

## CNS

### CENTRAL NERVOUS SYSTEM

Brain & Spinal Cord

**THE CNS FUNCTIONS LIE IN THE DIFFERENT PARTS OF THE BRAIN:**



### PARIETAL

- → Sensation
- → Spatial and visual perception

### FRONTAL

- → Motor control
- → Problem solving
- → Expressive speech → **BROCA'S AREA**

### OCCIPITAL

- → Sight
- → Visual perception & interpretation

### TEMPORAL

- → Auditory processing
- → Language comprehension → **WERNICKE'S AREA**
- → Memory retrieval

### SPINAL CORD

Made up of nerve cells that carry messages between the brain and the rest of the body

## PNS

### PERIPHERAL NERVOUS SYSTEM

Nerves outside the brain and spinal cord

### SOMATIC NERVOUS SYSTEM

Controls all 5 senses & movement

**THINK S FOR SENSES**

#### SENSORY NEURONS

**REST OF BODY → CNS**

- → **Afferent** neurons
- → Receives info from body to brain
- → Contain dorsal root ganglion
  - ▸ Carry sensory information from periphery to spinal cord

**EXAMPLE:** Moving hand away after touching hot stove

**&**

#### MOTOR NEURONS

**CNS → REST OF BODY**

- → **Efferent** neurons
- → Send info from brain to body
- → Contain ventral root ganglion
  - ▸ Carry instructions from brain/ SC to muscular contraction

**EXAMPLES:**
- ▸ Walking
- ▸ Speaking
- ▸ Swallowing

#### MEMORY TRICKS

**S A M E**

**S**ensory **A**fferent **M**otor **E**fferent

**D A V E**

**D**orsal **A**fferent **V**entral **E**fferent

**AFFERENT= ARRIVES**

Signals **arrive** at CNS

**EFFERENT= EXITS**

Signals **exit** CNS to body

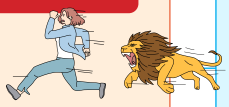
### AUTONOMIC NERVOUS SYSTEM

Controls **involuntary** physiological processes

**THINK THINGS THAT AUTOMATICALLY OCCUR:**
- ▸ Heart rate
- ▸ Respirations
- ▸ Digestion

#### SYMPATHETIC NERVOUS SYSTEM

**FIGHT OR FLIGHT RESPONSE**



- ▸ ↑ HR ↑ BP
- ▸ Dilates pupils
- ▸ Stops salivation
- ▸ ↑ blood sugar
- ▸ Relaxes bladder
- ▸ Inhibits digestion

**REMEMBER S FOR STRESS**

#### PARASYMPATHETIC NERVOUS SYSTEM

**REST & DIGEST SYSTEM**

- ▸ ↓ HR ↓ BP
- ▸ Constricts pupils
- ▸ Promotes salivation
- ▸ Bronchoconstriction
- ▸ Contracts bladder
- ▸ Stimulates GI motility

**REMEMBER R IN PARA FOR RELAX**

# NEURO ASSESSMENT

## GLASCOW COMA SCALE

Assesses **level of consciousness (LOC)**

### EYE OPENING

| Score | Response |
|---|---|
| 4 | **E**ye spontaneous |
| 3 | to **S**ound |
| 2 | to **P**ressure |
| 1 | **N**o response |

REMEMBER ESPN (LIKE THE SPORTS CHANNEL)

### VERBAL RESPONSE

| Score | Response |
|---|---|
| 5 | **O**riented |
| 4 | **C**onfused |
| 3 | Inappropriate **W**ords |
| 2 | **I**ncomprehensible speech |
| 1 | **N**o response |

REMEMBER OUR COUNTRY WIN

### MOTOR RESPONSE

| Score | Response |
|---|---|
| 6 | **O**beys commands |
| 5 | **L**ocalizes pain |
| 4 | **D**raws away from pain |
| 3 | **B**end/ abnormal flexion |
| 2 | **E**xtension abnormality |
| 1 | **N**o response |

REMEMBER OLD BEN

### SCORE INTERPRETATION

| Score | Interpretation |
|---|---|
| 13–15 | Mild brain injury |
| 9–12 | Moderate brain injury |
| 3–8 | Severe brain injury |
| ≤3 | Deep coma or brain dead |

LOWER SCORE= WORSE LOC

Obtain **BASELINE** upon admission & **REASSESS** per facility protocol

## ORIENTATION

Assesses **awareness**

### EXAMPLE QUESTIONS:

| | |
|---|---|
| **PERSON:** | "What is your name?" |
| **PLACE:** | "Where are you now?" |
| **TIME:** | "What month are we in?" |
| **EVENTS:** | "Do you remember what happened to you?" |

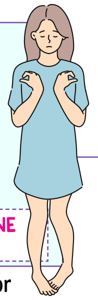
### AAOX4 MEANS:

Awake, Alert & Oriented to:

(1) PERSON
(2) PLACE
(3) TIME
(4) EVENTS/ SITUATION

## POSTURING

### DECORTICATE



**Flexed** posturing

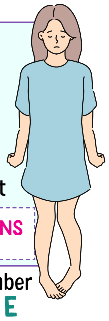
- Arms flexed in towards core
- Feet internally rotated & flexed

Problem in CERVICAL SPINE or CEREBRAL CORTEX

Remember CORE for DECORTICATE

WORSE OUTCOME

### DECEREBRATE



**Extended** posturing

- Arms & legs extended outwards
- Legs extended + plantar flexion of feet

Problem in MIDBRAIN or PONS

Look at E's to remember DECEREBRATE

## LOC LEVEL OF CONCIOUSNESS

Assesses **wakefulness**

### AWAKE

Alert & awake, eyes open

### SOMNOLENT

Sleeping/ sleepy, awake easily with stimuli

### LETHARGIC

Very drowsy, falls asleep between care

### OBTUNDED

Difficult to arouse, needs repeated mild/ moderate stimuli to stay awake

### STUPOROUS

Very difficult to arouse, needs repeated vigorous stimuli to stay awake

### COMATOSE

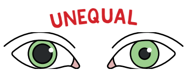
No response to any type of stimuli

## PUPIL ASSESSMENT

Assesses **PERRLA**

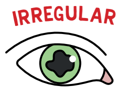
**P**UPILS **E**QUAL

Both pupils are the same size upon inspection



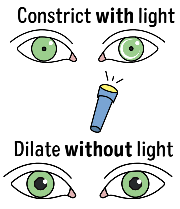
**R**OUND

Both pupils are round in shape



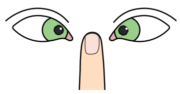
**R**EACTIVE TO **L**IGHT

Both pupils constrict when one eye is exposed to light



AND **A**CCOMODATION

Both pupils constrict & equally move to follow finger towards nose



## DTR DEEP TENDON REFLEXES

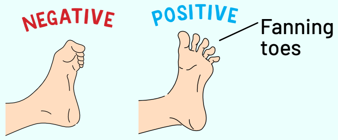
Assesses **motor response**

| Grade | Response |
|---|---|
| 4+ | Very brisk; hyperactive; with clonus |
| 3+ | Brisker than average; hyperreflexic |
| 2+ | Expected response; normal |
| 1+ | Somewhat diminished |
| 0 | Absent |

## BABINSKI REFLEX

Assesses integrity of the **Corticospinal Tract (CST)**

Sole of foot is stroked in J curve from heel upward



Positive results are **normal** in newborns-2 years
Positive results are **abnormal** in adults

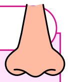
# CRANIAL NERVES

**CRANIAL NERVES** are nerves that originate in the brain and control various functions in the head, neck, & other parts of the body

## MEMORY TRICK

| Nerve | Mnemonic | Mnemonic | Type |
|---|---|---|---|
| Olfactory | On | Some | SENSORY |
| Optic | Occasion | Say | SENSORY |
| Oculomotor | Our | Marry | MOTOR |
| Trochlear | Trusty | Money | MOTOR |
| Trigeminal | Truck | But | BOTH |
| Abducens | Acts | My | MOTOR |
| Facial | Funny | Brother | BOTH |
| Vestibulocochlear | Very | Says | SENSORY |
| Glossopharyngeal | Good | Big | BOTH |
| Vagus | Vehicle | Brains | BOTH |
| Accessory | Any | Matter | MOTOR |
| Hypoglossal | How | Most | MOTOR |

## CN I OLFACTORY



Sense of smell

Think you only have **ONE** nose= CN **1**

### TEST

Have patient identify smell of substance with eyes closed

### NORMAL RESPONSE

Can correctly identify smell

**SENSORY**

## CN II OPTIC

E
F P
T O Z
L P E D

Vision ability

Think you have **TWO** eyes= CN **2**

### TEST

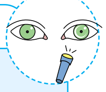
Snellen chart standing 20 feet away, covering one eye at a time

### NORMAL RESPONSE

Able to read with each eye & both eyes together

**SENSORY**

## CN III OCULOMOTOR



Upward eye movement and pupillary reflex

### TEST

Use penlight to check light reaction & finger to check accommodation

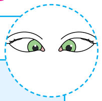
### NORMAL RESPONSE

Pupils constrict equally when brought towards nose & when exposed to light

**MOTOR**

OFTEN TESTED
**TOGETHER:**
- CN III
- CN IV
- CN VI

## CN IV TROCHLEAR



Downward & medial eye movements

### TEST

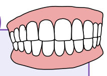
Use a penlight & move it medially & downwards

### NORMAL RESPONSE

Able to move eyes down & medially

**MOTOR**

## CN V TRIGEMINAL



Facial sensation and chewing

### TEST

**SENSORY:** Use sharp & dull side of pen to check for sensation with eyes closed

**MOTOR:** Ask patient to clench teeth with resistance

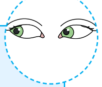
### NORMAL RESPONSE

**SENSORY:** Can distinguish between sharp & dull

**MOTOR:** Can open mouth against resistance & bite

**BOTH**

## CN VI ABDUCENS



Lateral or sideward eye movements

Think of abducens as **ABDUSIDES**

### TEST

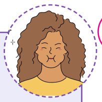
Use a penlight & move it sideways

### NORMAL RESPONSE

Able to move eyes laterally

**MOTOR**

## CN VII FACIAL



Facial movement & taste

### TEST

**SENSORY:** Taste test on the anterior tongue (**SWEET & SALTY**)

**MOTOR:** Ask patient to smile, raise eyebrows, close eyes, puff out cheeks

### NORMAL RESPONSE

**SENSORY:** Able to distinguish taste

**MOTOR:** Able to perform facial expressions without difficulty

**BOTH**

## CN VIII VESTIBULOCOCHLEAR

Hearing & sense of balance

### TEST

**HEARING:** Whisper near patient's ear

**BALANCE:** Ask patient to walk across the room & back

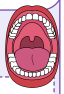
### NORMAL RESPONSE

**HEARING:** Can hear clearly in both ears

**BALANCE:** Able to stand & walk upright while maintaining balance

**SENSORY**

## CN IX GLOSSOPHARYNGEAL



Throat sensation, swallowing, salivation

### TEST

**SENSORY:** Taste test on the **posterior** tongue (**SOUR & BITTER**)

**MOTOR:** Have patient say "ahhhh"

### NORMAL RESPONSE

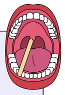
**SENSORY:** Able to distinguish taste

**MOTOR:** Uvula rises symmetrically upon saying "ahhhh"

**BOTH**

★ **CN IX & CN X** work **together** for gag & swallow

## CN X VAGUS



Digestion, HR, RR, immune system, swallowing

### TEST

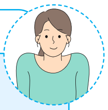
Use tongue blade to touch posterior pharynx to test gag reflex

### NORMAL RESPONSE

Gag reflex should be assessed followed by swallow

**BOTH**

## CN XI ACCESSORY



Shoulder & neck movement

### TEST

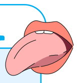
Shrug shoulders & turn head side to side with hand's resistance

### NORMAL RESPONSE

Able to shrug shoulders & turn head to each side without difficulty

**MOTOR**

## CN XII HYPOGLOSSAL



Tongue movement

### TEST

Ask the patient to protrude tongue and move it in different directions

### NORMAL RESPONSE

Able to move tongue without difficulty

**MOTOR**

# AMYOTROPHIC LATERAL SCLEROSIS (ALS)

## WHAT IS IT?

Neurodegenerative disorder affecting nerve cells responsible for controlling voluntary muscle movement

**A** → No/none
**MYO** → Muscle
**TROPHIC** → Nutrition

**LATERAL** → Sides
**SCLEROSIS** → Abormal hardening of body tissue

## CAUSES/ RISK FACTORS

Cause is **UNKNOWN**

- Genetics
- Age
- Gender
- Environmental; exposure to toxins

MOST COMMON AMONG 40 TO 70 YEAR OLD MALES

## SIGNS & SYMPTOMS

**MOST SYMPTOMS OF ALS RELATE TO MUSCULAR PROBLEMS**

- **Progressive weakness starting in limbs**
- Involuntary muscle twitches & reflexes
- Difficulty walking (frequent trips or falls)
- Easily fatigued by ADL's

**AS ALS PROGRESSES WILL HAVE ISSUES WITH:**

☛ Eating ☛ Speaking ☛ Breathing

## DIAGNOSTICS

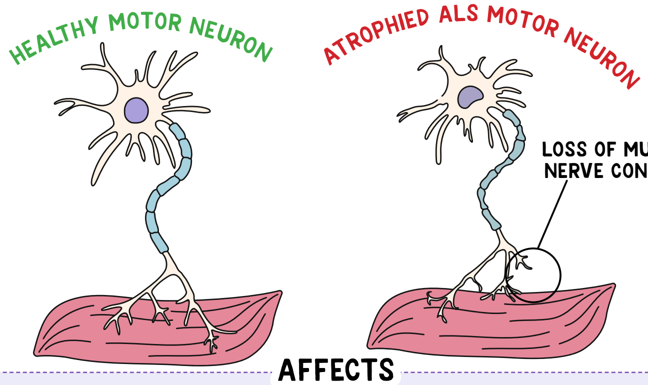
- Medical history and physical examination
- **ELECTROMYOGRAPHY (EMG):** detects activity of muscle fibers
- **NERVE CONDUCTION STUDY (NCS):** determines ability of nerves to send signals to the muscles
- **MAGNETIC RESONANCE IMAGING (MRI):** produces detailed images of spinal cord and brain
- **MUSCLE BIOPSY:** determine other pathologic causes

## TREATMENT

**NO CURE**

**GOAL OF TREATMENT:** Symptom control to improve quality of life

- **RILUZOLE (RILUTEK):** Inhibits Glutamate to decrease damage to motor neurons
- **EDARAVONE (RADICAVA):** Acts as antioxidant that prevents oxidative stress to neurons


HEALTHY MOTOR NEURON
ATROPHIED ALS MOTOR NEURON
LOSS OF MUSCLE TO NERVE CONNECTION

**AFFECTS**

**UPPER MOTOR NEURONS** send signals from brain to spinal cord

&

**LOWER MOTOR NEURONS** send signals from spinal cord to the muscles

## LIFE EXPECTANCY

- 3-5 years from the time of diagnosis
- ALS has no cure and is 100% fatal
- Most common cause of death: respiratory failure

PATIENT HAS MUSCLE PARALYSIS & YOU NEED MUSCLES TO BREATHE

## NURSING INTERVENTIONS

### AIRWAY

- Deep breathing and coughing exercises to promote lung expansion
- Incentive spirometer
- Chest physiotherapy as indicated
- Supplemental oxygen as ordered

### NUTRITION

- Encourage 2500cc of fluid intake a day
- High fiber diet or mechanical soft diet
- Small frequent meals

### PROMOTE COMFORT

- Elevate head of the bed
- Turn patient q2 hours

### ACTIVITY

- ROM exercises on affected limbs 3-4 times/day
- Schedule activities around rest periods

### PROMOTE SAFETY

- High fall risk
- Educate proper use of assistive devices when ambulating

**MANY PATIENTS EXPERIENCE LITTLE TO NO COGNITIVE DEFECITS– MAINLY FUNCTIONAL**

- Provide mentally stimulating activities
- Provide emotional support

# ALZHEIMER'S DISEASE

## WHAT IS IT?

A progressive brain disorder that affects memory, thinking & behavior, ultimately leading to a decline in cognitive abilities

**SLOW INSIDIOUS ONSET & VERY DIFFICULT TO DETECT IN EARLY STAGES**

## RISK FACTORS

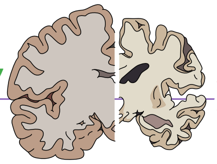
**HIGHEST RISK:**

- Age >65
- African Americans
- Latinos

- Advanced age
- Genetics and family history
- History of head trauma
- High blood pressure and cholesterol levels
- Poorly controlled Type 2 Diabetes
- Lifestyle factors
  - Excessive alcohol consumption & smoking
  - Poor sleeping patterns
  - Sedentary lifestyle

## DIAGNOSTICS

- **PET SCAN:** shows areas of the brain with abnormal build-up of protein
- **MRI/ CT SCAN:** evaluate shrinkage of brain regions



## TREATMENT

**NO CURE**

**GOAL OF TREATMENT:** Symptom control & improve quality of life

### CHOLINESTERASE INHIBITORS → DONEPEZIL

- Prevent the breakdown of **ACETYLCHOLINE**

→ Neurotransmitter important for **memory & learning**

### SSRI'S → SERTRALINE

- Can delay the development and growth of **amyloid-beta proteins and plaques**, which have been shown to be a contributor to Alzheimer's

## ALZHEIMER'S IS A TYPE OF DEMENTIA

**DEMENTIA** is an umbrella term that encompasses a group of symptoms, not a specific disease. Different types of dementia include:

- **Alzheimer's** (most common)
- Vascular Dementia
- Lewy-Body Dementia
- Frontotemporal Dementia

**ALZHEIMER'S IS THE MOST COMMON TYPE OF DEMENTIA**

## STAGES OF ALZHEIMER'S

### EARLY STAGE: MILD

- Independent in ADL's
- Becoming forgetful
- Difficulty recalling info
- Unable to travel alone
- Withdraws socially

**MEMORY LOSS IS OFTEN FIRST & MAIN SYMPTOM**

- Forgetting names
- Misplacing items
- Not recalling events

### MIDDLE STAGE: MODERATE

- Needs assistance with ADL's
- Unable to manage money or finances
- Difficulty driving, gets lost
- Disorientation to time & place
- May be incontinent

### LATE STAGE: SEVERE

- Completely dependent, bedridden
- Incontinent
- Unable to speak or communicate
- Loss of psychomotor skills
- Agnosia (loss of facial recognition)

## NURSING INTERVENTIONS

- Implement a structured daily routine
- Encourage patient to perform activities that promote independence & engagement
- Coordinate with healthcare team and family to plan for extended comprehensive care
- Reorient patient as needed (use calendars, TV, etc.)
- Encourage use of alternative methods to decrease stress (↑ stress= ↑ memory loss)

# DELIRIUM

## WHAT IS IT?

A disturbance in cognitive abilities that results in confused thinking & reduced awareness of the environment

There is **ALWAYS** an underlying cause of delirium

## RISK FACTORS

- Advanced age
- Secondary to medical conditions
  - Infection
  - Stroke
  - Metabolic imbalance
  - Chronic pain
- Medications
- Surgery
- Alcohol or substance abuse
- Prolonged ICU stays
  (ICU Delirium)

**ICU DELIRIUM** is a type of delirium specifically in patients in the Intensive Care Unit due to:

- Sedatives and analgesics
- Sleep deprivation (from alarms & constant care)
- Psychological stress from being in the ICU

## CAM SCALE

### CONFUSION ASSESSMENT METHOD

Evidence-based tool used for detecting delirium

**ASSESSES FOR:**

**ACUTE ONSET & FLUCTUATION:**
Is the change in behavior/ thought process sudden and is it fluctuating or constant?

**INATTENTION**
Is the patient having difficulty focusing their attention and becoming easily distracted?

**DISORGANIZED THINKING**
Is the patient's thinking disorganized or incoherent?

- Constantly switching subjects
- Irrelevant topics
- Illogical flow of ideas

**ALTERED LOC**
Overall, what is the patient's level of consciousness and wakefulness?

**A POSITIVE CAM SCORE REQUIRES IMMEDIATE FURTHER INVESTIGATION!**

## DIFFERENCE BETWEEN

| DELIRIUM | & DEMENTIA |
|---|---|
| Occurs suddenly (hours to days) | Occurs over time (years) |
| Has underlying cause | Exact cause unknown |
| Is reversible when underlying cause treated | Is usually not reversible |

A sudden change in neuro status is a **MEDICAL EMERGENCY**

⚠ **ALERT PCP IMMEDIATELY!**

## SYMPTOMS

★ **FLUCTUATE THROUGHOUT THE DAY**

- Confusion and disorientation
- Agitation or restlessness
- Inattention
- Disturbance of consciousness (ranging from drowsiness to severe agitation)
- Disordered thinking or perception (such as hallucinations and delusions)
- Rapid changes in cognitive function
- Sleep-wake cycle disturbances

## TREATMENT

**GOAL: TREAT UNDERLYING CAUSE!**

- Antibiotics for infection
- Supportive therapy & hydration for drug/ alcohol withdrawal

**SEVERE CASES OF DELIRIUM CAN PUT PATIENT AT RISK FOR HARM TO SELF OR OTHERS**

- Antipsychotics (Haldol most commonly used)
- Benzos (Ativan)

**MONITOR CLOSELY!**
Can cause
**RESPIRATORY DEPRESSION**

## NURSING INTERVENTIONS

- Reorient patient and provide emotional support
- Reduce environmental stimuli (lights, noise, alarms if possible)
- Promote safety; bed alarm, close to nurse's station,1:1 sitter if neccessary
- Teach relaxation exercises
- Utilize restraints and medications needed to promote safety **(LAST RESORT!)**

# CEREBROVASCULAR ACCIDENT
## STROKE

## WHAT IS IT?

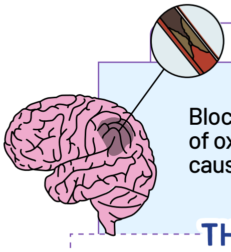
Reduced or interrupted blood supply to the brain, leading to oxygen deprivation and death of brain cells

## PATHO

BLOCKED ARTERY/ RUPTURED VESSEL / BLOOD CLOT
↓
BRAIN CELLS DON'T GET ENOUGH OXYGEN AND NUTRIENTS
↓
BRAIN CELL DEATH

## TYPES OF STROKE

### ISCHEMIC



Blocked artery leads to loss of oxygen in the brain which causes ischemia

**THROMBOTIC**

Blood clot or plaque forms on artery wall

**EMBOLIC**

Fatty plaque or blood clot breaks away & flows to brain where it blocks blood flow

**TREATMENT**

**FIBRINOLYTIC THERAPY:**

↳ **TPA** Tissue Plasma Activator (Alteplase)
- Breaks down blood clots that cause obstruction

Must be given within **4.5 HOURS** of onset of symptoms

### TIA

**TRANSIENT ISCHEMIC ATTACK**

AKA "MINI STROKE"

**Temporary** decrease in blood flow that causes stroke-like symptoms

- → Usually only lasts a few minutes
- → Doesn't cause permanent damage
- → Due to ischemic etiology

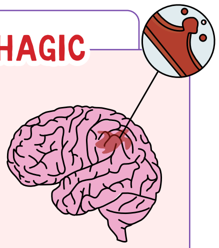
INDICATES HIGH RISK FOR
ISCHEMIC STROKE

**TREATMENT**

**ANTIPLATELET THERAPY**
- → Aspirin
- → Clopidogrel

**CAROTID ENDARTERECTOMY**
- → If blockage in carotid artery

### HEMORRHAGIC



Weakened or ruptured blood vessels burst and allow blood to leak out

Leads to ISCHEMIA & INCREASED ICP

Most common cause is
**UNCONTROLLED HYPERTENSION**

Associated with **higher morbidity & mortality** than ischemic

**TREATMENT**

- → **CRANIOTOMY:** Lowers ICP by draining blood in brain
- → **MANNITOL:** Reduces ICP by promoting osmotic diuresis

**NOT A CANDIDATE FOR TPA**
Would worsen bleeding

## SYMPTOMS

- **B** Balance loss
- **E** Eyesight changes
- **F** Facial drooping
- **A** Arm weakness
- **S** Speech difficulty
- **T** Time to call 911 immediately

NOTE TIME OF SYMPTOM ONSET!

### LEFT SIDED SYMPTOMS

- Right sided hemiparesis
- Impaired speech
- Depression, anxiety

(patient **aware** of deficits)

### RIGHT SIDED SYMPTOMS

- Left sided hemiparesis
- Spatial defecits
- Impaired judgement

(patient **unaware** of deficits)

## DIAGNOSTICS

- → CT Scan GOLD STANDARD
- → MRI
- → ECG
- → Echocardiogram

REPEAT CT SCAN AT 24 HOURS when given tPA

## RISK FACTORS

★ **CARDIOVASCULAR DISEASE:**
↑ BP & ↑ Cholesterol

- → **ETHNICITY** (Hispanic & Black)
- → **AGE** (Age 55+)
- → **FAMILY HISTORY**

**LIFESTYLE FACTORS:**
- Smoking & drinking
- Sedentary lifestyle
- Obesity
- Stress

## NURSING INTERVENTIONS

- → Frequent neuro checks (per protocol)
- → Monitor vital signs (especially BP for ICP)
- → Maintain airway
- → NPO until pass swallow evaluation
- → DVT prevention (compression stockings)

**TURNING & POSITIONING**
- → Elevate HOB to avoid increased ICP
- → Q2 Turning
- → Full ROM exercises

Especially for HEMORRHAGIC STROKE

**SAFETY & COMMUNICATION**
- → Bed alarm on
- → Assist with ADL's
- → Communicate clearly & be patient

# GUILLAIN–BARRE SYNDROME

## WHAT IS IT?

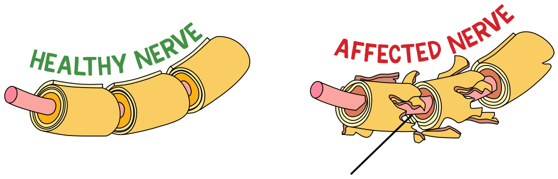
Autoimmune disease where the body's immune system attacks the peripheral nerves leading to muscle weakness and paralysis

GBS affects the **PERIPHERAL NERVOUS SYSTEM**

## PATHO

**ANTIBODIES ATTACK PERIPHERAL NERVES**
↓
**MYELIN SHEATH & NERVES GET DAMAGED**
↓
**NERVES ARE UNABLE TO SEND SIGNALS**

**MYELIN SHEATH:** Protective covering for nerve



Myelin sheath exposes nerves, allowing damage to occur

## RISK FACTORS

**NO KNOWN CAUSE**

- → **Recent infection**
- → Recent vaccination
- → Recent surgery
- → Recent injury or trauma
- → Hodgkin's lymphoma

**CAMPYLOBACTER JEJUNI INFECTION** most common cause

## SYMPTOMS

**ACUTE ONSET & ASCENDING MUSCLE WEAKNESS**

Max weakness reached in **two weeks**

- → Tingling/numbness in extremities **1ST SIGN**
- → Loss of reflexes
- → Difficulty breathing or swallowing
- → **Progressive** muscle weakness

**BEGINS IN LOWER EXTREMITIES & PROGRESSES UPWARD BILATERALLY**

## DIAGNOSTICS

**LUMBAR PUNCTURE:** tests cerebrospinal fluid for higher than normal protein levels

**HIGH PROTEIN IN CSF MAY INDICATE ANTIBODIES/ INFLAMMATION**

**ELECTROMYOGRAPHY:** tests nerve function

**NERVE CONDUCTION STUDIES:** measures speed of nerve signals

## TREATMENT

**PLASMAPHERESIS:** Filters unhealthy antibodies from the blood

**INTRAVENOUS IMMUNOGLOBULIN (IVIG):** Infusion of healthy antibodies

**SYMPTOM MANAGEMENT**
- → Analgesics for muscle & joint pain
- → Anticoagulants for VTE (for paralyzed patients)

**GBS IS SELF–LIMITING, BUT SEVERE MUSCLE PARALYSIS CAN LEAD TO RESPIRATORY FAILURE**

## NURSING INTERVENTIONS

**ABC'S**
- → Monitor breathing, VS, & ABG
- → Chest physiotherapy
- → Keep HOB elevated
- → Anticipate need for mechanical ventillation
- → VTE prophylaxis (SCD's)

**AIRWAY IS PRIORITY!**

**SUPPORTIVE CARE**
- → ROM exercises
- → Reposition every 2 hours
- → PT & OT
- → TPN or tube feeds if swallow impaired

# ENCEPHALOPATHY

## WHAT IS IT?

Generalized term to describe disease of the brain tissue that alters brain structure & function

**ENCEPHALO** → Brain
**PATHY** → Disease

**MULTIPLE CAUSES:**
- Infection
- Trauma
- Toxemia
- Anoxia

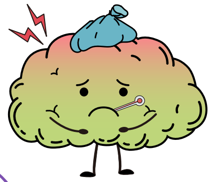
## DIFFERENCE BETWEEN

**ENCEPHALITIS** & **ENCEPHALOPATHY**

**ENCEPHALITIS:** Refers to **inflammation of brain tissue itself**

**ENCEPHALITIS** can **cause ENCEPHALOPATHY**

**ENCEPHALOPATHY:** Refers to **decreased mental state** due to a variety of factors that can cause brain dysfunction



## TYPES OF ENCEPHALOPATHY

### ACUTE

**ABRUPT CHANGES BUT REVERSIBLE**
if underlying cause is treated promptly

| TYPE | CAUSE |
|---|---|
| **WERNICKE** | Vitamin B1 deficiency caused by alcohol abuse, malnutrition, or malabsorption |
| **UREMIC** | Urea buildup secondary to renal failure |
| **HEPATIC** | Ammonia buildup secondary to liver failure |
| **TOXIC METABOLIC** | Toxin buildup due to anoxia, infection or metabolic imbalances |
| **HYPERTENSIVE** | Severe hypertension leading to cerebral edema which causes ↑ ICP |

### CHRONIC

**SLOW CHANGES BUT IRREVERSIBLE**
Onset is **progressive** & happens over time

| TYPE | CAUSE |
|---|---|
| **TRAUMATIC** | Repeated trauma to the brain (accidents, contact sports) |
| **HYPOXIC ISCHEMIC**<br>Changes may occur **ACUTELY** but are **IRREVERSIBLE** | Decreased blood flow to brain tissue (cardiac arrest, fetal infections) |
| **SPONGIFORM** | Prion disease (mutation of prion protein) leads to tiny holes in brain |
| **HASHIMOTO'S** | **EXACT CAUSE UNKNOWN**<br>May be due to inflammation from abnormal immune response |
| **GLYCINE** | Due to deficiency in enzyme that breaks down glycine (amino acid) |

## SYMPTOMS

**ALTERED MENTAL STATUS** **HALLMARK SIGN**

- → Confusion or forgetfulness
- → Difficluty concentrating & thinking & processing information
- → Behavioral changes
- → Decreased LOC (lethargy)

**SYMPTOMS GET WORSE OVER TIME**

- Twitching
- Shaking
- Muscle weakness
- Seizures
- Difficulty speaking & swallowing

## NURSING INTERVENTIONS

- → Close monitoring
  - LOC
  - VS
  - EKG
  - ICP
  - Labs
  - Airway
- → Reorient regularly
- → **SAFETY**
  - Bed alarm on
  - Hourly rounding
  - Near nurse's station
- → Prevent increased ICP
- → Seizure precautions
- → NPO if impaired swallow
- → Maintain calm environment
  - HOB elevated
  - ↓ stimuli
  - Avoid straining
- → Educate family

## TREATMENT

★ **TREATMENT DEPENDS ON CAUSE & TYPE OF ENCEPHALOPATHY**

- → **WERNICKE'S:** Thiamine (Vitamin B1) replacement
- → **UREMIC:** Usually requires dialysis to remove urea
- → **HEPATIC:** Lactulose (to ↓ ammonia buildup)
- → **TOXIC METABOLIC:** Find & treat underlying cause
- → **HYPERTENSIVE:** Antihypertensives
- → **MEDICATIONS**
  - Antibiotics for infection
  - Glucocorticoids for inflammation
  - Anticonvulsants to prevent/ manage seizures
- → Plasmapharesis for autoimmune etiology

# FIBROMYALGIA

## WHAT IS IT?

Chronic condition characterized by widespread muscle pain, tenderness & fatigue

**FIBRO** → Fibrous tissue
**MY** → Muscle
**ALGIA** → Pain

## EXACT CAUSE UNKNOWN

Pathology is not completely understood, but is known that patients usually have low serotonin levels which:

- Inhibit pain signals **(nocioceptors)**
- Decrease substance P **(chemical involved in pain perception)**
- Inhibit nerve growth factor **(amplifies pain signals)**

SEROTONIN = HAPPY HORMONE

## RISK FACTORS

- Gender (more common in women)
- Family history
- Traumatic events like car accidents
- Repetitive injuries
- Infections
- Depression & anxiety disorders
- Autoimmune diseases
    - Lupus
    - Rheumatoid Arthritis

## SYMPTOMS

### 3 PRIMARY SYMPTOMS:

- ★ **Widespread pain**
- ★ **Fatigue**
- ★ **Fibro fog** → unable to focus & concentrate

### SECONDARY SYMPTOMS:

- Sleep problems
- Fatigue and tiredness
- Depression and anxiety
- Headaches and migraines
- Problems with memory, thinking & concentration

## DIAGNOSTICS

**NO SPECIFIC LABORATORY OR IMAGING TEST**

→ Physical exam; based on clinical findings

① Bilateral pain below & above the waist
② Chronic generalized pain for at least 3 months

**MUST MEET BOTH CRITERIA**

### TO DIAGNOSE FIBROMYALGIA, NEED TO HAVE PAIN IN 4/5 AREAS:

**LEFT UPPER REGION**
- Shoulder
- Arm
- Jaw

**LEFT LOWER REGION**
- Hip
- Buttock
- Leg

**AXIAL REGION**
- Neck
- Back
- Chest
- Abdomen

**RIGHT UPPER REGION**
- Shoulder
- Arm
- Jaw

**RIGHT LOWER REGION**
- Hip
- Buttock
- Leg

## TREATMENT

**NO CURE**

**GOAL OF TREATMENT:** Symptom control & improve quality of life

### ALTERNATIVE THERAPIES

- Accupuncture
- Massage
- Physical therapy

### MEDICATION

- NSAIDS or Tylenol
- Antidepressants (Duloxetine)
- Anticonvulsants (Gabapentin)
- Muscle relaxants (Cyclobenzaprine)

## NURSING INTERVENTIONS

### ENCOURAGE LIFESTYLE MODIFICATIONS

- Low impact exercise (yoga & walking)
- Stress management
- Healthy diet

### TEACH TO AVOID TRIGGERS

- Infection
- Injury
- Stress

### TEACH STRESS REDUCTION TECHNIQUES

- Guided imagery
- Meditation
- Breathing exercises

# HYDROCEPHALUS

## WHAT IS IT?

Abnormal build-up of cerebrospinal fluid (CSF) in the brain

**HYDRO** → Water
**CEPHALUS** → Head

Leads to **INCREASED INTRACRANIAL PRESSURE (ICP)**

## FUNCTIONS OF CSF

- ★ Shock absorber of the brain and spinal cord
- ★ Delivers nutrients to the brain tissue
- ★ Removes waste from the brain
- ★ Regulates changes in pressure

## CAUSES

**OVERPRODUCTION OF CSF:** disorders causing too much CSF to be produced
↳ Genetic disorders such as aqueductal stenosis

**OBSTRUCTION:** blockage in the flow of CSF
- ▸ Brain tumors
- ▸ Trauma (head injury or hemorrhage)

**POOR ABSORPTION:** villi & vessels have trouble absorbing CSF causing build up
- ▸ CNS infections (Meningitis)

## SYMPTOMS

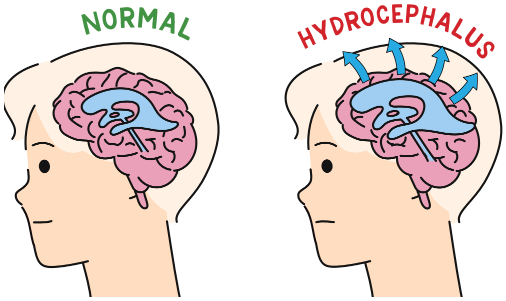
- → Headache
- → Blurred vision
- → Difficulty walking
- → Excessive drowsiness
- → Loss of bladder control
- → Macrocephaly (enlarged head)
- → Seizures
- → Nausea/ vomiting

**SUNSET SIGN**
Bilateral downward gaze of eyes (lower lid covers bottom of iris & pupil)

## DIAGNOSTICS

- → **CT SCAN & MRI**
- → **LUMBAR PUNCTURE:** assess CSF profile
- → **FUNDOSCOPIC EXAM:** assess optic nerve
  ↳ HYDROCEPHALUS CAN CAUSE THE OPTIC NERVE TO SWELL, AKA **PAPILLEDEMA**

**CONTRAINDICATIONS FOR LUMBAR PUNCTURE**
- ▸ **↑ ICP from brain tumor:** high risk of herniation
- ▸ **Infection near puncture site:** high risk of infected CSF
- ▸ **Abnormal coagulation:** high risk bleeding or clotting



## PATHO

Overproduction/ Poor absorption/ Obstruction
↓
CSF builds up in the brain
↓
Compressive effect on brain tissue
↓
Increase in intracranial pressure
↓
**DECLINE OF NEUROLOGIC FUNCTION**

**NOTE:** **CHRONIC** hydrocephalus can lead to **DILATED VENTRICLES** & **NORMAL ICP**

## TREATMENT

★ **EARLY DETECTION AND TREATMENT= BETTER OUTCOME**

- → **SHUNT:** Catheter placed in ventricle and threaded to another part of the body to drain so it can be absorbed
- → **VENTRICULOSTOMY:** Drains excess CSF into external collection system
- → **NEUROSURGERY:** If mass/ tumor present
- → **MEDICATIONS**
  - ▸ **Diuretics:** Promote osmotic diuresis (Furosemide or Acetazolamide)
  - ▸ **Anticonvulsants:** Prevent seizures
  - ▸ **Antibiotics** (if caused by infection)

## NURSING INTERVENTIONS

- → Monitor VS, electrolytes & neuro status
- → Monitor head circumference & signs of increased ICP
- → Keep head of bed elevated to promote venous drainage and prevent increased ICP
- → Avoid straining
  - ▸ Assist with turning and repositioning
  - ▸ Stool softeners to prevent constipation
  - ▸ Maintain calm environment

# INCREASED ICP

## WHAT IS IT?

Increase in pressure inside the skull

**NORMAL ICP: 5–15 MMHG**
**›20 MMHG NEEDS TREATMENT**

## MONRO KELLIE HYPOTHESIS

**BRAIN, BLOOD, & CSF**

If one **increases**, another must **decrease** in volume to alleviate pressure

**IF PRESSURE IS CONTINUOUS, BODY IS UNABLE TO COMPENSATE**

## RISK FACTORS/ CAUSES

- Excess CSF (hydrocephalus)
- Head injury
- Encephalitis
- Meningitis
- Subdural or epidural hematoma (bleeding into layers in between brain)
- Brain tumor (puts pressure on brain)
- Stroke (hemorrhagic)

## TREATMENT

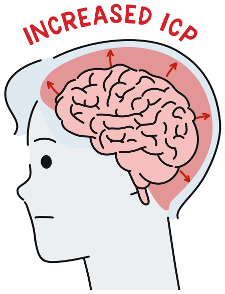
**TREAT THE UNDERLYING CAUSE**
(hypertension, infection, brain tumor, etc.)

- **CRANIOTOMY:** Remove part of the skull to ease swelling
- **VENTRICULOSTOMY:** Drain to reduce pressure
- **MEDICATIONS**
  - **Diuretics (Acetazolamide and Mannitol):** Promote osmotic diuresis and decrease ICP
  - **Pressors or Antihypertensives:** maintain blood pressure for ICP
  - **Barbiturates:** lower ICP
  - **Anticonvulsants:** prevent seizures

**MANNITOL** is a concentrated sugar that draws water from the brain into the blood to be excreted

**MONITOR FOR SIGNS OF FLUID OVERLOAD**

- Crackles
- JVD
- Edema



## ↑ ICP LEADS TO ↓ CEREBRAL BLOOD FLOW

Increased pressure in brain
↓
Brain gets "squeezed"
↓
**BRAIN SWELLING & EDEMA**

**CAN LEAD TO HERNIATION IF NOT TREATED**

Displacement of brain due to severe skull pressure

## SYMPTOMS

- Decreased LOC **EARLIEST SIGN**
- Vision changes
- Headache
- Seizures
- Vomiting **without nausea**
- Behavioral changes
- + Babinski Reflex
- Abnormal posturing
- Hemiplegia

### CUSHING'S TRIAD **LATE SIGN**

- Widened pulse pressure (↑ SBP ↓ DBP )
- Bradycardia
- Irregular breathing

**WARNING SIGN OF BRAIN HERNIATION**

## NURSING INTERVENTIONS

### CLOSE MONITORING

- Vital signs
- Neuro checks
- ICP
- Electrolytes
- Airway & breathing
- I & O

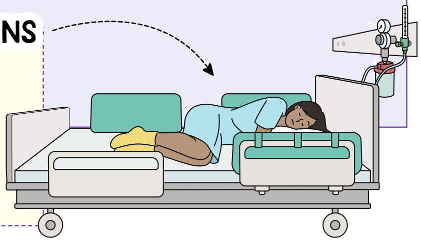
Depressed breathing can lead to **HYPERCAPNIA**
Cause cerebral vessels to dilate & ICP to rise

### MAINTAIN ICP

- HOB ≥30 degrees
- Avoid valsalva maneuver (straining)
- Decreased stimuli

### SEIZURE PRECAUTIONS

- ★ Suction at bedside
- ★ Oxygen setup
- ★ Padded siderails
- ★ Bed in low position



# MENINGITIS

## WHAT IS IT?

Inflammation of the linings of the **meninges**

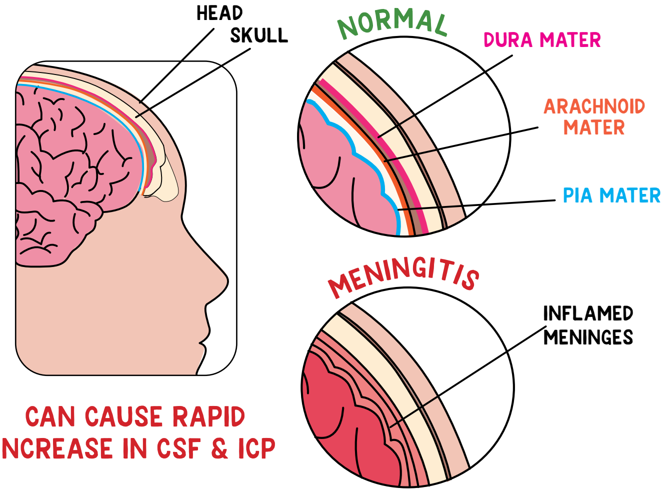
### MENINGES

Protective membranes covering the brain & spinal cord

**DURA MATER**
Outer tough layer lining skull

**ARACHNOID MATER**
Middle web-like layer

**PIA MATER**
Inner delicate layer lining brain



CAN CAUSE RAPID INCREASE IN CSF & ICP

## RISK FACTORS

- → Skipping meningitis vaccinations
- → Living in close living situations
- → Age
- → Weak immune system

**VIRAL**
Most common in children <5 years old

**BACTERIAL**
Most common in newborns & teens

## DIAGNOSTICS

- → **CT SCAN**
- → **BLOOD CULTURES:** determine causative agent
- → **LUMBAR PUNCTURE & CSF ANALYSIS:** determine CSF profile & causative agent

**VIRAL**
clear & normal glucose

**BACTERIAL**
cloudy & ↓ glucose

Remember **B** in **B**acterial for **BAD**

MORE SEVERE

| | VIRAL | BACTERIAL |
|---|---|---|
| CAUSED BY: | Enteroviruses<br>Herpes simplex virus<br>HIV<br>Mumps virus<br>West Nile virus | Streptococcus pneumoniae<br>Mycoplasma pneumoniae<br>Neisseria meningitidis<br>Haemophilus influenzae B<br>Listeria monocytogenes |
| CSF PROFILE | **Appearance:** Clear<br>**Pressure:** Normal<br>**Protein:** Normal<br>**Glucose:** Normal<br>**Gram stain:** Negative<br>**WBC:** Lymphocytes | **Appearance:** Cloudy<br>**Pressure:** Increased<br>**Protein:** Increased<br>**Glucose:** Decreased<br>**Gram stain:** Positive<br>**WBC:** Neutrophils |

* Can also be caused by fungi or parasites but not common

## SYMPTOMS

- → Altered LOC
- → Nuchal rigidity (neck stiffness)
- → Irritability & agitation
- → Fever
- → Headache
- → Photophobia
- → Positive Brudzinki's sign
- → Positive Kernig's sign
- → High pitched cry in infants
- → Seizures

**BRUDZINSKI'S SIGN**
Knee & hip flexion when neck flexed

**KERNIG'S SIGN**
Pain with passive extension of knee

## TREATMENT

### MEDICATION

- → Antibiotics or antivirals (depending on type)
- → Anticonvulsants to prevent/ manage seizures
- → Steroids to reduce inflammation
- → Osmotic diuretics (Mannitol) to ↓ cerebral edema

### SUPPORTIVE CARE

- → IV fluids for hydration
- → Analgesics/ anti-inflammatories

## NURSING INTERVENTIONS

### INITIATE DROPLET PRECAUTIONS

- → Frequent neuro checks & vital signs
- → Ice packs/ cooling blanket as needed for fever
- → Seizure precautions

### PREVENT INCREASED ICP

- → HOB ≥30 degrees
- → Avoid valsalva maneuver (straining)
- → Decreased stimuli

# MULTIPLE SCLEROSIS

## WHAT IS IT?

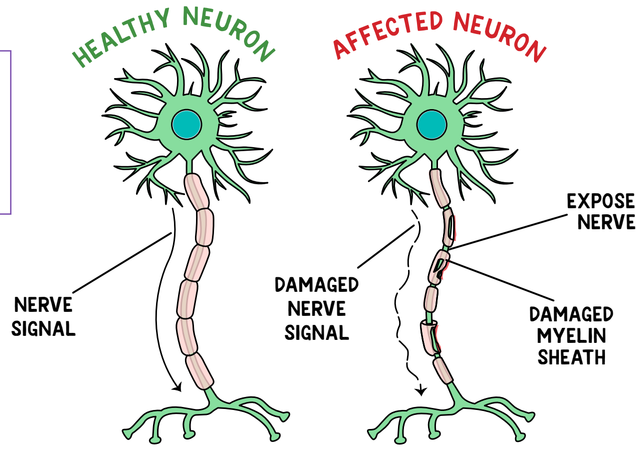
Autoimmune disease that affects **MYELIN SHEATH** leading to inflammation & scarring of nerves, leading to decreased nerve signal transmission

**USUALLY ASSOCIATED WITH RELAPSES & REMISSIONS**

### MYELIN SHEATH

Insulating layer formed around nerves that allows electrical impulses to transmit along nerve cells

In **MULTIPLE SCLEROSIS**, the body is attacking it's own **MYELIN SHEATH**!



**AFFECTS NERVES IN BRAIN & SPINAL CORD, LEADING TO SENSORY & MOTOR DEFECITS**

## RISK FACTORS

- → Age (typically diagnosed between 20-40)
- → Gender (more common in women)
- → Family history of MS
- → Certain genetic variations
- → Exposure to certain viruses (Epstein-Barr, HHV-6)
- → Low vitamin D levels
- → Smoking
- → Obesity

## DIAGNOSTICS

- → **MRI**
- → **LUMBAR PUNCTURE:** assess CSF profile

## TYPES of MS

| TYPE | DESCRIPTION |
|---|---|
| CLINICALLY ISOLATED SYNDROME | Single, first episode that lasts for 24 hours |
| RELAPSING-REMITTING<br>MOST COMMON | Characterized by periods of relapses & remissions |
| PRIMARY PROGRESSIVE | Symptoms worsen progressively without remissions |
| SECONDARY PROGRESSIVE | Periods of relapses & remissions with progressive worsening of symptoms |

## SYMPTOMS

**SENSORY**

- → Numbness or tingling
- → + Lhermitte sign
- → Visual disturbances
- → Bowel & bladder dysfunction

**LHERMITTE SIGN**

Short & intense electric shock sensation that travels down neck & spine to extremities

**MOTOR**

- → Weakness & fatigue
- → Spasms & stiffness
- → Coordination and balance problems

**COGNITIVE**

- → Difficulty with memory or attention
- → Mood swings

**SYMPTOMS MAY WORSEN WITH HEAT**

## TREATMENT

**NO CURE**

**GOAL OF TREATMENT:** Symptom control & slow disease progression

- → **BETA INTERFERON:** Immunosuppressant & anti-inflammatory to reduce relapses
- → **CORTICOSTEROIDS:** Used for relapses
- → **BACLOFEN:** Decreases muscle spasms

## NURSING INTERVENTIONS

- → Encourage activity independence
- → Cluster activites with frequent rest periods
- → Safety precautions (may lack balance & spatial awareness)
- → Encourage ROM exercises & gentle strengthening exercises
- → Educate to avoid triggers

**MS TRIGGERS**

- ▸Heat
- ▸Stress
- ▸Infection
- ▸Trauma
- ▸Vitamin D deficiency
- ▸Lack of sleep
- ▸Intense exercise
- ▸Poor diet

# MYASTHENIA GRAVIS

## WHAT IS IT?

Autoimmune disease where body attacks receptors at **neuromuscular junction** that allows voluntary muscle control, leading to muscle weakness

**MYASTHENIA** → Abnormal muscle weakness

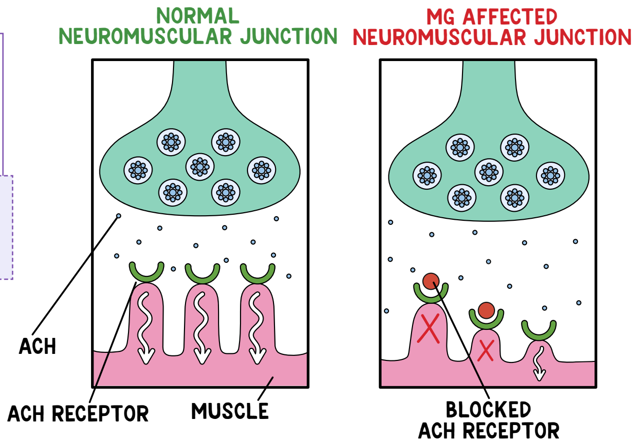
**GRAVIS** → Grave/ severe

### NEUROMUSCULAR JUNCTION

Where motor neuron & muscle meet for acetylcholine to be released

### ACETYLCHOLINE (ACH)

Neurotransmitter that allows **muscular contraction**


NORMAL NEUROMUSCULAR JUNCTION
MG AFFECTED NEUROMUSCULAR JUNCTION
ACH
ACH RECEPTOR
MUSCLE
BLOCKED ACH RECEPTOR

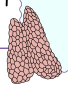
**IN MYASTHENIA GRAVIS,** some ACH receptors are blocked, not allowing muscle fibers to access ACH, which leads to **MUSCLE WEAKNESS**

## RISK FACTORS

- → Women <40 years old
- → Men > 60 years old
- → Autoimmune disorders
- → Thymoma

**THYMUS PLAYS LARGE ROLE IN IMMUNE SYSTEM**

Tumor may cause excess release of antibodies that attack receptor sites



## DIAGNOSTICS

- → **IMMUNOASSAY:** determine presence of antibodies attacking muscle receptor sites
- → **ELECTROMYOGRAPHY:** assess muscle contraction
- → **TENSILON TEST:** used to diagnose

**TENSILON TEST**

Patient's symptoms will temporarily improve after injected if positive for MG

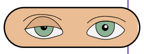
Patient's symptoms will become worse after injected if negative for MG

**IF NEGATIVE, MUST GIVE ATROPINE FOR ANTIDOTE**

**EDROPHONIUM (TENSILON)**
prevents breakdown of acetylcholine at neuromuscular junction

## SYMPTOMS

- → Diplopia (double vision)
- → Ptosis (upper eyelid drooping)
- → Mask-like expression (facial weakness)
- → Dysarthria
- → Difficulty chewing or speaking
- → Fatigue that gets worse throughout day
- → Shortness of breath



**DESCENDING WEAKNESS**

Weakness starts in face and progresses **downwards**

## TREATMENT

**NO CURE**

**GOAL OF TREATMENT:** Symptom prevention & management

- → **Anticholinesterase (Pyridostigmine):** prevents breakdown of ACH so more available
- → **Corticosteroids:** decrease inflammation
- → **IVIG (Immunoglobulin):** severe cases
- → **Thymectomy:** reduce immmune response

**TAKE 30-60 MINS BEFORE MEALS**
For strength for chewing & swallowing

## COMPLICATIONS

### CHOLINERGIC CRISIS (OVERMEDICATION)

Overstimulation of neuromuscular junction due to excess acetylcholine

- ▸ Pupil constriction
- ▸ Bronchoconstriction
- ▸ Abdominal cramping
- ▸ Urinary frequency

**TREATMENT: ATROPINE**

### MYASTHENIA CRISIS (UNDERMEDICATION)

Severe muscle weakness caused by the worsening of symptoms

**CAN CAUSE RESPIRATORY FAILURE!**

**TREATMENT: IVIG**

## NURSING INTERVENTIONS

- → **Monitor respiratory status**
- → Monitor for signs of progressing weakness
- → Keep suction at bedside
- → Keep head of bed elevated
- → Safety precautions; HIGH FALL RISK
- → Schedule activity and big meals at **beginning of day** when patient has most strength

**WEAKNESS GETS WORSE WITH ACTIVITY & IMPROVES WITH REST**
Schedule rest periods with activity

# PARKINSON'S DISEASE

## WHAT IS IT?

Autoimmune disease caused by loss of nerve cells in part of brain called the **substantia nigra** which is responsible for producing **DOPAMINE**

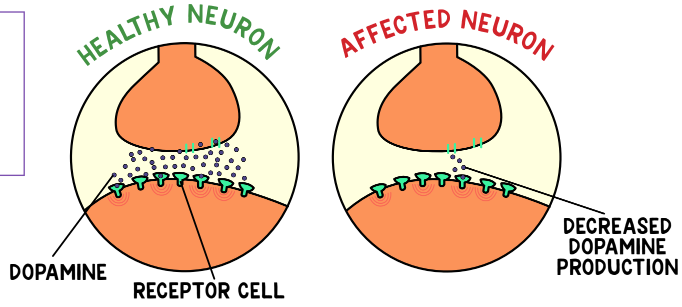
### SUBSTANTIA NIGRA

Part of basal ganglia which is part of midbrain & controls movement

### DOPAMINE

Neurotransmitter responsible for :

- ⋆ Movement
- ⋆ Memory
- ⋆ Pleasure & satisfaction
- ⋆ Motivation



**LACK OF DOPAMINE LEADS TO INCREASE IN ACETYLCHOLINE**

↳ Leads to overstimulation and increased cholinergic activity

**PROGRESSES GRADUALLY OVERTIME**

## RISK FACTORS

**CAUSE NOT COMPLETELY KNOWN**

- → Certain medications that block dopamine
- → Gender: most common in men
- → Age: 50+ years old more common
- → Repeated head injuries
- → Family history
- → Environmental factors (exposure to pesticides, toxins and poisons)

## DIAGNOSTICS

**NO SPECIFIC TEST TO DIAGNOSE**

- → **Medical history & neuro examination**
- → **MRI/ PET scan**
- → **CSF analyis:** may show ↓ dopamine levels

**DIAGNOSED BASED OFF EVAL FOR SYMPTOMS**

- ▸ Speech & swallow eval
- ▸ Barium swallow
- ▸ PT eval
- ▸ OT eval

Must have **BRADYKINESIA** & **1 OR MORE OF OTHER 3 HALLMARK SIGNS** for diagnosis

## SYMPTOMS

- ⋆ **RESTING TREMOR**
- ⋆ **RIGIDITY**
- ⋆ **BRADYKINESIA**
- ⋆ **BALANCE ISSUES**

} HALLMARK SIGNS

- → Stooped posture
- → Pill-rolling tremor
  (tremors of hands & fingers that looks like rolling a pill)
- → Mask-like face
- → Shuffling gait
- → Cogwheel rigidity
  (stop & go motion when extending limb)
- → Depression

## TREATMENT

**NO CURE**

**GOAL OF TREATMENT:** Symptom prevention & management

MOST COMMON **Carbidopa/ Levadopa (Sinemet):** adds dopamine to brain

- → **Dopamine Agonists (Mirapex & Ropinirole):** stimulate dopamine receptors in brain
- → **COMT Inhibitors:** used with Sinemet to prevent "wearing off" effects
- → **Amantidine:** stimulates dopamine in brain

## NURSING INTERVENTIONS

### AMBULATION

- → Wear low heeled shoes
- → Reduce rugs & cords to avoid tripping
- → Encourage assistive devices
- → Always assist with ambulation

⚠ HIGH FALL RISK

### NUTRITION

- → Assess swallow ability
- → OT & PT
- → Adequate fiber intake
  (at risk for constipation)
- → ↑ calorie, soft diet

### EDUCATION

- ▸ Use rocking motion to initiate movement
- ▸ Include regular exercise to help maintain movement
- ▸ Avoid foods high in B6 (effects Levadopa intake)
- ▸ Never abruptly stop taking meds

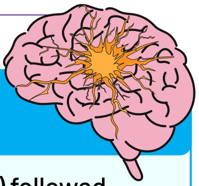
# SEIZURES

## WHAT IS IT?

Sudden uncontrolled, abnormal burst of electrical activity between neurons in the brain

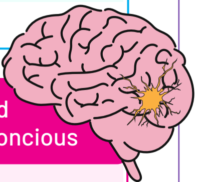
›2 SEIZURE EPISODES IS Dx AS **EPILEPSY**

## TYPES of SEIZURES



**GENERALIZED:**
- ⋆ All of brain is affected
- ⋆ Patient will be unconcious

| | |
|---|---|
| **TONIC-CLONIC** AKA "GRAND MAL" | Period of stiffening (tonic phase) followed by period of rhythmic jerking (clonic phase) |
| **TONIC** | Stiffening |
| **CLONIC** | Recurrent contracting & relaxing |
| **ABSENCE** AKA "PETITE MAL" | Staring in dreamlike state (most common in children) |
| **MYOCLONIC** | Brief jerking of extremity without loss of LOC |
| **ATONIC** | Sudden loss of muscle tone |



**PARTIAL (FOCAL):**
- ⋆ Specific area of brain is affected
- ⋆ Patient may be concious or unconcious

| | |
|---|---|
| **SIMPLE** | Patient maintains awareness throughout seizure; symptoms vary depending on area affected |
| **COMPLEX** | Patient may lose awareness of surroundings throughout seizure; may have **automatisms**<br>Nonpurposeful, repetitive motions<br>**EX.** lip smacking |

## NURSING INTERVENTIONS

**DURING SEIZURE**
- ⋆ **Maintain airway!**
- → Turn patient to side
- → NOTHING in mouth
- → Do NOT restrain
- → Loosen restrictive clothing
- → If sitting/standing, lower to ground or bed

**ASSESS:**
- → Time & duration
- → Seizure characteristics
- → Neuro status and VS after seizure

**SEIZURE LASTING ›5 MINS**
or if patient fails to regain LOC b/w seizures

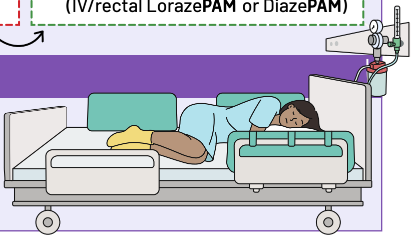
**=STATUS EPILEPTICUS**

MEDICAL EMERGENCY

**PRIORITIES**
- ⋆ Maintain airway (may require intubation)
- ⋆ Give benzodiazepine (IV/rectal LorazePAM or DiazePAM)

### SEIZURE PRECAUTIONS

- Oxygen & suction at bedside
- Bed in low position
- Padded siderails
- No restrictive clothing
- Pillow supporting head



## SEIZURE PHASES:

① **PRODROMAL**
Early signs that can occur hours to days before actual seizure (Ex:mood changes, anxiety)

② **AURA**
Warning signs that may appear seconds to minutes before seizure occurs (Ex. feeling of deja vu, odd smell or taste)

③ **ICTUS**
Actual seizure taking place (usually about 1-3 minutes long)

④ **POSTICTAL**
Recovery after seizure; may feel fatigued, confused or have loss of conciousness

## RISK FACTORS

- → Fever (most common cause in children)
- → Cerebral edema
- → CNS infections (meningitis)
- → Electrolyte imbalances (hyponatremia)
- → Alcohol withdrawal
- → Hypoglycemia
- → Tumors

Can also be **CHRONIC** due to **residual damage** from conditions such as **TBI** & **STROKE**

## TRIGGERS

Stimuli that provoke the onset of a seizure in susceptible individuals

- Stress
- Lack of sleep
- Hormonal changes
- Flashing lights
- Infection
- Alcohol or drug use

## DIAGNOSTICS

- → **EEG:** to diagnose type and origin of seizure
  - no caffeine or seizure meds before test!

## TREATMENT

### MEDICATION

- → Anticonvulsants (Dilantin, Keppra, Gabapentin, etc.)
  (see **Anticonvulsants** page in *Pharmacology Section*)
- → Barbiturates (Phenobarbital) to suppress CNS
- → Benzos (Ativan): often used in Status Epilepticus
  - **Monitor for respiratory depression!**

### PROCEDURES

- → **Vagal nerve stimulation:** implanted device sends electrical pulses to vagus nerve
- → **Craniotomy:** remove part of brain tissue where seizures taking place

# SPINAL CORD INJURY

## WHAT IS IT?

Damage to any part of the spinal cord or nerves at the end of the spinal cord (cauda equina)

Spinal cord injury damage is **IRREVERSIBLE**

## CLASSIFIED AS:

### COMPLETE

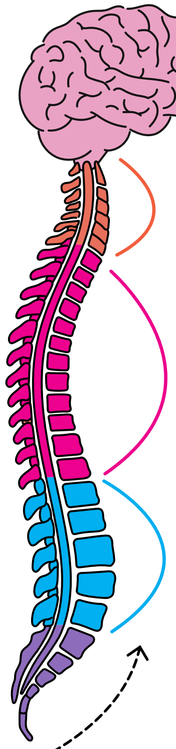
All sensory and motor function is completely lost below spinal cord injury

### INCOMPLETE

Partial motor or sensory function is present below spinal cord injury

## CAUSES

| TRAUMATIC | NON-TRAUMATIC |
|---|---|
| Falls | Infection |
| Sports injury | Inflammation |
| Gunshot wound | Disc degeneration |
| Motor vehicle accident | Cancer |



### CERVICAL NERVES

Includes C1-C8

**C4 & ABOVE**

Quadraplegia + loss of respiratory function

**ABOVE T1**

Quadraplegia

### THORACIC NERVES

Includes T1-T12

**BELOW T1**

Paraplegia (lower extremity paralysis)

### LUMBAR NERVES

Includes L1-L5

**ABOVE L1**

**Hypertonia** (spastic muscle tone)
+ spastic neurogenic bladder

**BELOW L2**

**Hypotonia** (flaccid muscle tone)
+ flaccid neurogenic bladder

## SYMPTOMS

- → Loss of sensation below injury
- → Loss of motor function below injury
- → Loss of reflexes below injury
- → Bladder or bowel dysfunction

Symptoms vary depending on location & severity of injury

**HIGHER UP THE INJURY= MORE SEVERE**

## TREATMENT

**MEDICATION**

- → Steroids for inflammation
- → Anaglesics for pain
- → Muscle relaxants for muscle spasms

**PROCEDURES**

- → Laminectomy: relieves compression
- → Spinal fusion: stabilizes spine by fusing vertebrae

## COMPLICATIONS

**INJURIES T6 OR HIGHER**

### NEUROGENIC SHOCK

Loss of communication between SNS & nerve impulses

- Hypotension
- Bradycardia
- Dry, flushed skin

**TREATMENT**

- IV fluids
- Vasopressors
- Atropine

### AUTONOMIC DYSREFLEXIA

Stimuli below SCI initiates sympathetic response in body

- Severe hypertension
- Severe headache
- Diaphoresis

**TREATMENT**

- High fowler's position
- Call MD immediately
- Look for stimuli
  - Distended bladder
  - Fecal impaction
  - Skin breakdown
  - Tight clothing

## NURSING INTERVENTIONS

**ACUTE PHASE**

★ Stabilize spine & maintain airway

**C4 & ABOVE CAUSES LOSS OF RESPIRATORY FUNCTION!**

**ONGOING CARE**

- → Log roll patient (turn as one unit)
- → Closely monitor VS & breathing
- → Monitor for complications
- → Q2 turning to prevent skin breakdown
- → Provide emotional support
- → ROM exercises & PT/ OT

# TRAUMATIC BRAIN INJURY

## WHAT IS IT?

Disruption in brain functioning do to external trauma to head, scalp, skull, or direct damage to brain tissue

**FOCAL= LOCAL**
Damage confined to one area of brain

**DIFFUSE= DISTANT**
Widespread damage to multiple areas of brain

## CLASSIFIED AS:

### PRIMARY

Injury that takes place at **time of impact**

- Car accident
- Gunshot wound
- Fall

### SECONDARY

Changes that evolve over hours to days after injury

- Ischemia
- Hypoxia
- Cerebral edema

## TYPES OF DAMAGE

### OPEN (PENETRATING)

Object pierces skull & enters brain tissue

**HIGHER RISK OF INFECTION**

### CLOSED (BLUNT)

External force causes brain to move within skull

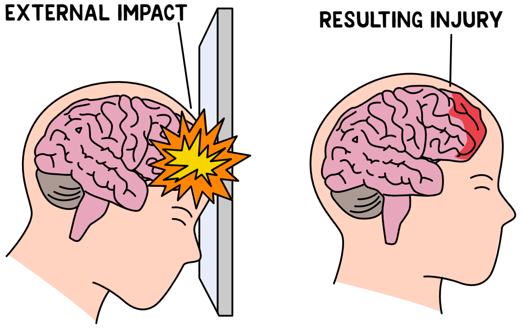
**HIGHER RISK OF ↑ ICP**

## TYPES OF CLOSED TBI

| CONCUSSION | CONTUSION | LACERATION |
|---|---|---|
| Rapid back & forth movement of brain | Localized bruising of the brain | Tears in scalp without puncturing skull |

## TYPES OF HEMATOMAS

| EPIDURAL | SUBDURAL | SUBARACHNOID |
|---|---|---|
| Bleeding between the skull & dura mater | Bleeding between dura mater & arachnoid mater | Bleeding between arachnoid mater & pia mater |
| Caused by arterial bleeding<br>**RAPIDLY EXPANDING** | Caused by venous bleeding<br>**SLOWLY EXPANDING** | Most common cause:<br>**RUPTURED ANEURYSM** |



## DIAGNOSTICS

- → **CT SCAN:** assess for hematomas
- → **MRI:** assess for brain tissue damage
- → **X-RAY:** assess for skull fracture
- → Glasgow Coma Scale

## SYMPTOMS

**MILD**

- → Surface wounds
- → Headache
- → Dizziness

**CSF leakage from ears or nose may indicate SKULL FRACTURE**

**MODERATE-SEVERE**

- → Decreased LOC
- → Confusion
- → Amnesia
- → Vision abnormalities
- → Seizures

**CUSHING'S TRIAD** LATE SIGN

- Widened pulse pressure (↑ SBP ↓ DBP)
- Bradycardia
- Irregular breathing

**WARNING FOR BRAIN HERNIATION** ⚠

## TREATMENT

**MILD INJURY= SUPPORTIVE CARE**

- → Rest
- → OTC analgesics
- → Monitor closely for worsening symptoms

**MEDICATIONS**

- → **Anticonvulsants:** treat & prevent seizures
- → **Osmotic diuretics (Mannitol):** decrease ICP
- → **Sedation:** Induced coma

(comatose brain requires less O2 & ↓ risk of secondary injury)

**PROCEDURES**

- → **Ventriculostomy:** drain excess CSF
- → **Craniectomy:** part of skull temporarily removed to relieve pressure

## NURSING INTERVENTIONS

★ **PRIORITY:** Maintain airway & ICP

**CLOSE MONITORING**

- → Vital signs
- → ICP & neuro status
- → Respiratory status

**FREQUENT NEURO CHECKS**

- LOC
- Pupil assessment
- GCS

**PREVENT INCREASED ICP**

- → HOB ≥30 degrees
- → Avoid valsalva maneuver (straining)
- → Decreased stimuli
- → Avoid frequent suctioning

# VENTRICULAR DRAINS

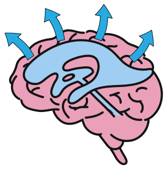
## WHAT IS IT?

Surgical procedure where a catheter is inserted into cerebral ventricle to drain excess cerebrospinal fluid

★ STERILE PROCEDURE

## INDICATIONS:

- Hydrocephalus
- Traumatic Brain Injury
- Meningitis

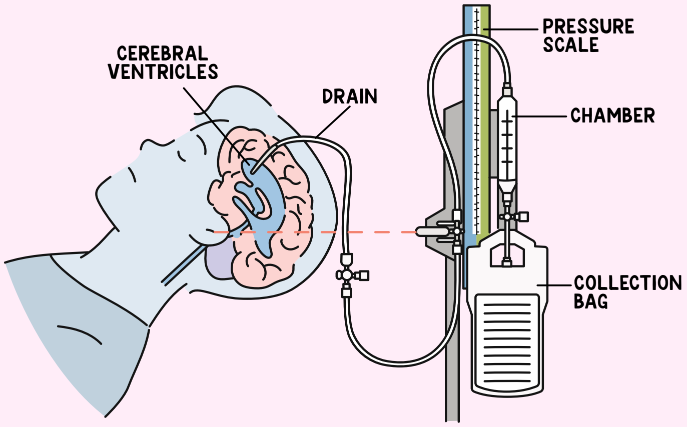


ANYTHING THAT CAUSES CSF BUILDUP IN THE BRAIN

## EXTERNAL VENTRICULAR DRAIN (EVD)

Catheter placed in cerebral ventricle & connected to external drainage system

**FOR TEMPORARY DRAINAGE**



### NURSING INTERVENTIONS

**PRESSURE SCALE MUST BE LINED UP WITH LEVEL OF TRAGUS (WHERE VENTRICLES ARE)**

- If too **HIGH**, will act like vacuum & may cause excessive drainage
- If too **LOW**, not enough suction & CSF won't drain or will backflow

- → Monitor hourly CSF drainage
- → Monitor ICP
- → Maintain HOB at 30 degrees (leveled to tragus) unless indicated
- → Clamp drain before repositioning (remember to unclamp once leveled)
- → Frequent neuro checks & VS
- → Maintain dressing & change per order

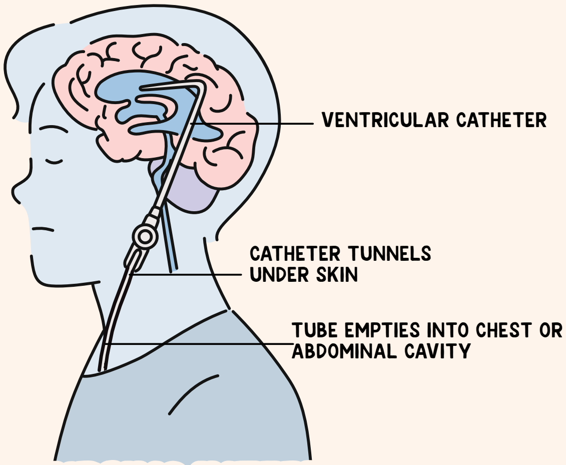
**WHEN TO NOTIFY MD**

- If NO drainage occurs for an hour
  (could mean occlusion in catheter & lead to increased ICP)
- A LOT of drainage suddenly occurs
  (MD may ask you to adjust the level or clamp the drain)
- Clots or tissue debri begin to drain
- Drastic change in ICP (**HIGH** or **LOW**)

## VENTRICULOPERITONEAL SHUNT (VP SHUNT)

Catheter placed in cerebral ventricle & connected to chest/abdominal cavity to drain internally

**FOR PERMANENT DRAINAGE**


VENTRICULAR CATHETER
CATHETER TUNNELS UNDER SKIN
TUBE EMPTIES INTO CHEST OR ABDOMINAL CAVITY

### NURSING INTERVENTIONS

**DURING HOSPITAL STAY**

- → Neuro checks & VS
- → Pain management
- → Monitor incision site
- → ICP monitoring
- → Assist patient with ADL's and position changes to avoid increased ICP from straining

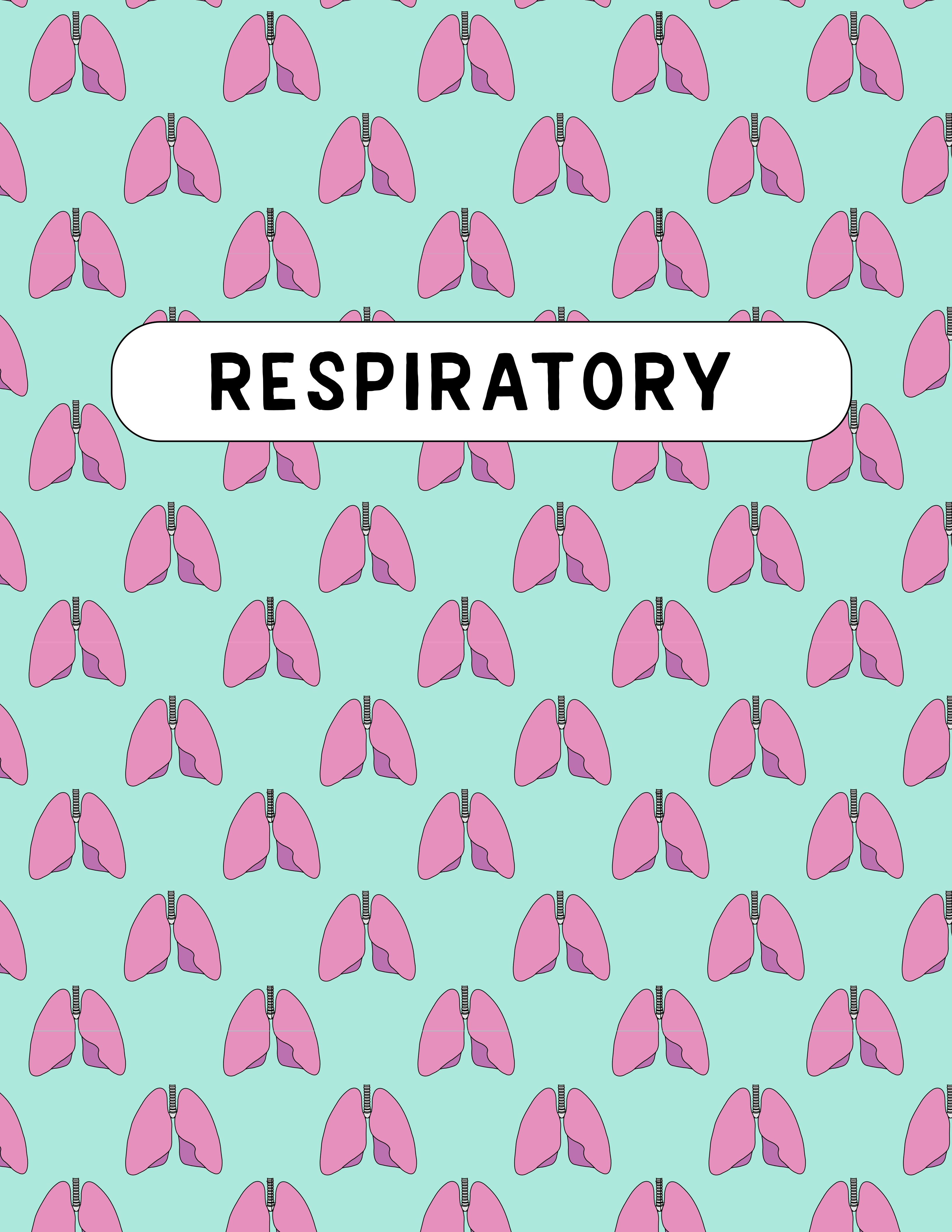
**UPON DISCHARGE**

★ EDUCATION IS VITAL!

- Do not touch site
- Avoid high risk physical activities
- Keep incision clean & dry
- No showering until approved by MD
- No heavy lifting for 6 weeks

⚠ **AT RISK FOR INFECTION**

Requires check up at least **every 3 years**



# RESPIRATORY

# RESPIRATORY OVERVIEW

## UPPER RESPIRATORY TRACT FUNCTIONS

Located **outside** the chest cavity

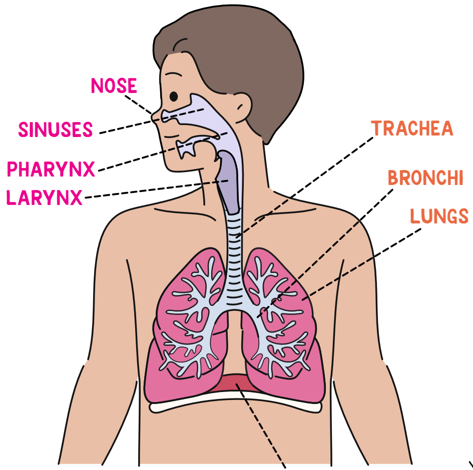
**NOSE**
Warms, humidifies & filters air

**SINUSES**
Air-filled spaces that produce mucous to keep nose moist

**PHARYNX**
Passage of food & air to lungs & digestive system

**LARYNX**
Contains **VOCAL CORDS & EPIGLOTTIS:**

- **VOCAL CORDS:** Produces sound for speech
- **EPIGLOTTIS:** Covers vocal cords during swallowing



## LOWER RESPIRATORY TRACT FUNCTIONS

Located **inside** the chest cavity

**TRACHEA**
Airway that carries 02 to lungs

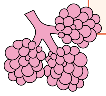
**BRONCHI**
Distributes air throughout lungs to bronchioles & alveoli

Right bronchus is wider, shorter & more vertical
**MORE PRONE TO ASPIRATION**

**LUNGS**
Supplies 02 to body & exhales C02

**DIAPHRAGM**
Muscle used for inhaling & exhaling

**ALVEOLI**
Air sacs where gas exchange occurs



## STEPS of GAS EXCHANGE

### VENTILATION

Act of breathing air in & out of the lungs

Inhale 02 & exhale C02

### DIFFUSION

02 diffuses from alveoli to move to capillaries (rest of body)

C02 diffuses from capillaries to alveoli to be exhaled

### CIRCULATION

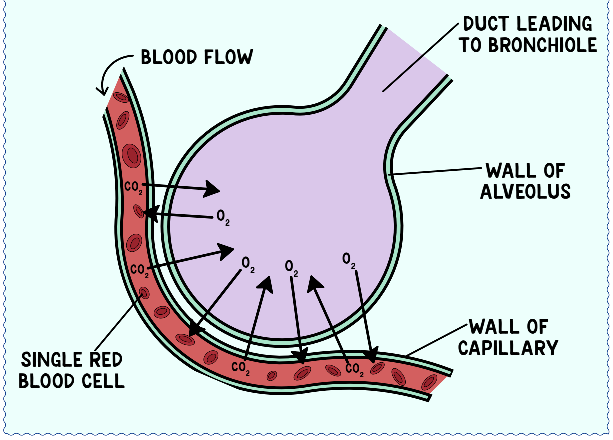
Transport of oxygenated blood to the peripheries & the rest of the body

### CELL EXCHANGE

Diffusion of 02 & C02 takes place on the cellular level

02 goes into cell & C02 leaves the cell

## ALEVOLUS GAS EXCHANGE



## FIO2

**F**RACTION OF **I**NSPIRED **O**XYGEN

Air you **breathe in**

**ROOM AIR= 21%**

Each liter of oxygen adds about 4%

**EXAMPLES:**
1L= 24%
2L=28%
3L=32%

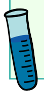
## PAO2

**P**ARTIAL PRESSURE OF **O**XYGEN

02 pressure in arterial blood

**NORMAL RANGE:**
80-100 mmHg

**HYPOXEMIA**
Means low 02 in the **blood**



## SAO2

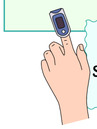
**A**RTERIAL **O**XYGEN **S**ATURATION

02 saturation in arterial blood

**NORMAL RANGE:**
94-100%

**HYPOXIA**
Means low 02 in the **tissues**

**SP02**
is arterial oxygen saturation measured by **pulse oximeter**



## BREATHING MECHANICS

### INSPIRATION

- When you **inhale** (breathe in)
- Diaphragm **contracts** (moves down)
- Allows **oxygen** to flow into the lungs
- Intrapulmonary pressure < atmospheric pressure

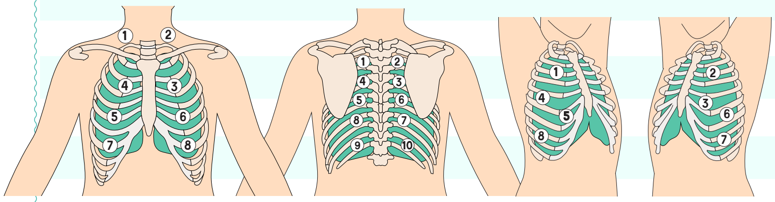
Air moves from **HIGH PRESSURE** to **LOW PRESSURE**

### EXPIRATION

- When you **exhale** (breathe out)
- Diaphragm **relaxes** (moves up)
- Allows **carbon dioxide** to leave the lungs
- Intrapulmonary pressure > atmospheric pressure

# RESPIRATORY ASSESSMENT

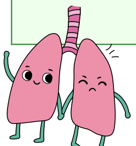
## AUSCULTATING LUNG SOUNDS



- ★ Ask patient to sit upright and rest arms on lap
- ★ Try to listen in a quiet environment (turn off TV if on)
- ★ Instruct to take deep breaths
- ★ Listen on bare skin (not on clothing)
- ★ Listen on inhale and exhale
- ★ Auscultate the front, back and both sides of the chest
- ★ Listen from top to bottom

## NORMAL LUNG SOUNDS

| BRONCHIAL/TRACHEAL | BRONCHOVESICULAR | VESICULAR |
|---|---|---|
| **SOUNDS:**<br>▸ High<br>▸ Loud<br>▸ Shallow | **SOUNDS:**<br>▸ Medium pitched<br>▸ Hollow | **SOUNDS:**<br>▸ Soft<br>▸ Low |
| **LOCATION:**<br>Trachea & larynx | **LOCATION:**<br>**Anterior:** 1st & 2nd intercostal space<br>**Posterior:** Between scapulae | **LOCATION:**<br>Anterior & posterior over most of lungs |



## ADVENTITIOUS LUNG SOUNDS

| TYPE | SOUNDS LIKE: | CAUSED BY: | CONDITIONS: |
|---|---|---|---|
| **WHEEZING** | High pitched "musical flute" | Narrowed airway or bronchoconstriction | → Asthma<br>→ COPD |
| **FINE CRACKLES** | High pitched crackling (rubbing hair between fingers) | Inflammation of lungs | → Pneumonia<br>→ Bronchitis<br>→ Asthma<br>→ Emphysema |
| **COARSE CRACKLES** | Low pitched crackling (pulling apart velcro) | | |
| **RHONCHI** | Low rattling/ rumbling (snoring) | Fluid & secretions in airway | → URI<br>→ Pneumonia |
| **STRIDOR** | High pitched inspiratory whistle (seal barking) | Upper airway narrowed or obstructed | → Foreign body<br>→ Croup<br>→ Epiglottitis |
| **PLEURAL FRICTION RUB** | Low pitched dry rubbing (Walking on creaky floor) | Pleural layers rubbing against each other from inflammation | → Lung cancer<br>→ Pneumonia<br>→ Emphysema |

## HYPOXIA

Decreased O2 supply to tissue & cells

### EARLY SIGNS:

- →Restlessness
- →Anxiety
- →Tachycardia
- →Tachypnea

### IMMEDIATE NURSING INTERVENTIONS

- →Raise head of bed
- →Administer oxygen
- →Provide oral suctioning
- →Pain meds or reposition if from pain
- →Assess need for resp. treatments
- →Ensure pulse oximeter is accurate!

### FACTORS AFFECTING PULSE OX ACCURACY

- ▸ Nail polish
- ▸ Poor circulation
- ▸ Cold fingers
- ▸ Patient movement
- ▸ Poor placement

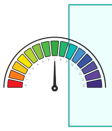
### LATE SIGNS:

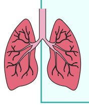
- ▸ Bradycardia
- ▸ Extreme restlessness
- ▸ Dyspnea
- ▸ Hypotension
- ▸ Cyanosis

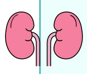
**EMERGENCY!** ⚠

- ▸ **Notify MD immediately**
- ▸ Complete interventions above
- ▸ Call rapid response
- ▸ Do NOT leave patient!

# ARTERIAL BLOOD GAS
## BASICS





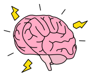


| VALUE | WHAT IS IT? | REGULATED BY: | NORMAL RANGE |
|---|---|---|---|
| PH | Measures acid-base balance in body | LUNGS & KIDNEYS | 7.35-7.45 |
| CO2 | Amount of carbon dioxide in the blood | LUNGS | 35-45 MMHG |
| HCO3 | Amount of bicarbonate in the blood | KIDNEYS | 22-26 MEQ/ L |
| PAO2 | Amount of oxygen in the blood | LUNGS | 80-100 MMHG |

THINK **C**O2 FOR A**C**ID

THINK **B**ASE FOR **B**ICARBONATE

NOT USED TO DETERMINE ABG; JUST MEASURES OXYGENATION STATUS



### MEMORY TRICK

Once you remember **7.35-7.45**, just drop the 7 to get **35-45** for CO2

↓

**LUNGS** are above **KIDNEYS** so think **CO2** above **HCO3**

## INTERPRETING AN ABG

### 1 IS THE PH ACIDOTIC (ACID) OR ALKALOTIC (BASIC)?

Pair this with the above memory trick to remember which values are acidic & which are basic

Write out the numbers & match the values to the correlating side

To remember which is which:

**USE ABA & BAB**

|  |  |  |  |  |
|---|---|---|---|---|
| A | PH | <7.35 | >7.45 | B |
| B | CO2 | <35 | >45 | A |
| A | HCO3 | <22 | >26 | B |

A=ACID B=BASE

### 2 IS THE CO2 HIGH OR LOW?

USE THE ABA & BAB TABLE

<35 (low CO2) = BASIC

>45 (high CO2) = ACIDIC

### 3 IS THE BICARB HIGH OR LOW?

USE THE ABA & BAB TABLE

<22 (low HCO3) = ACIDIC

>26 (high HCO3) = BASIC

### 4 IS IT RESPIRATORY OR METABOLIC IN NATURE?

USE THE TIC-TAC-TOE METHOD

If pH & CO2 in same column, it is respiratory in nature

If pH & HCO3 in same column, it is metabolic in nature

IF THE PH IS NORMAL, DETERMINE IF IT'S CLOSER TO ACIDOSIS OR ALKALOSIS

TIC-TAC-TOE METHOD

EXAMPLE

| ACIDIC | NORMAL | BASIC |
|---|---|---|
| 7.31<br>(PH) |  | 28<br>(HCO3) |
| 67<br>(CO2) |  |  |

This example is respiratory in nature

### 5 IS IT COMPENSATED?

If pH is **out of range** and CO2 or HCO3 is **in range**
UNCOMPENSATED

If **all three values** are out of range
PARTIALLY COMPENSATED

If pH is normal
FULLY COMPENSATED

# ARTERIAL BLOOD GASES

## RESPIRATORY ACIDOSIS vs. RESPIRATORY ALKALOSIS

## RESPIRATORY ACIDOSIS

**Retention** of carbon dioxide by the lungs

CARBON MAKES THE BODY MORE ACIDIC

↑ CO2 GOES UP >45

↓ PH GOES DOWN <7.35

Kidneys try to compensate by **retaining** BICARBONATE (HCO3) to bring pH back to normal

### CAUSES

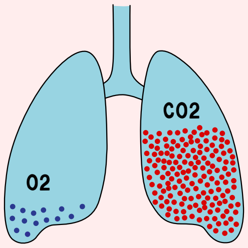
**ANYTHING THAT CAUSES RESPIRATORY DEPRESSION**

- Drugs (opioids, sedatives, anesthesia)
- Increased ICP (affects neuro functioning that controls RR)
- Neuromuscular disease (Guillain-Barre)
- Sleep apnea

**ANYTHING THAT CAUSES IMPAIRED GAS EXCHANGE**

- COPD
- Pneumonia
- Chest wall trauma
- Pulmonary edema

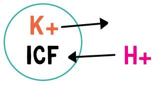
All cause damage to alveoli which is where gas exchange takes place!



Exhaling allows CO2 to be released, so think anything that weakens this response will cause **increased CO2**

### SYMPTOMS

- Altered LOC (confusion, drowsiness, headache)
- ↓ BP
- ↓ RR (<12)
- Hypoxia
- Dysrhythmias (from hyperkalemia)



To compensate for acidosis, hydrogen ions move into cells to lower pH, causing K+ to leave cells & enter blood, causing **hyperkalemia**

### TREATMENT

- Administer oxygen
- Suction secretions as needed
- Turn, cough, & deep breath
- Administer antibiotics (for pneumonia)
- Monitor & treat high potassium levels
- Hold all meds that cause respiratory depression
- May need respiratory treatment
- Sodium bicarbonate in severe cases

May require **INTUBATION** if CO2 >50 & severe respiratory distress/ inability to protect airway

## RESPIRATORY ALKALOSIS

Breathing out too much carbon dioxide

LOW CO2 MAKES THE BODY ALKALOTIC

↓ CO2 GOES DOWN <35

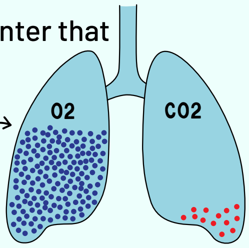
↑ PH GOES UP >7.45

Kidneys try to compensate by **excreting** BICARBONATE (HCO3) to bring pH back to normal

### CAUSES

**ANYTHING THAT CAUSES HYPERVENTILATION**

- Anxiety
- Pain
- Fever
- Asthma
- Pulmonary embolism
- Aspirin toxicity
- Mechanical overventillation
- Brain injuries affecting the center that controls RR

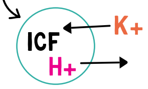


Exhaling allows CO2 to be released, so think if you're breathing really fast, **too much CO2 is being released**

### SYMPTOMS

- ↑RR & depth **MOST COMMON**
- ↑ HR
- Confusion & lethargy
- Tetany (may have + Chvostek's Sign)
- Dysrhythmias (from hypokalemia)

Higher pH causes more calcium to bind to albumin, leading to **HYPOCALCEMIA**



To compensate for acidosis, hydrogen ions move out of cells to increase pH, causing K+ to enter cells & leave blood, causing **hypokalemia**

### TREATMENT

- Teach patient breathing techniques to help slow down breathing (Ex: rebreathing into paper bag)
- Provide emotional support
- Supplemental oxygen
- Monitor & treat low K & Ca levels
- Anti-anxiety medication
- Analgesics for pain
- Decrease tidal volume & rate in mechanically ventillated patients

# ARTERIAL BLOOD GASES

## METABOLIC ACIDOSIS vs. METABOLIC ALKALOSIS

### METABOLIC ACIDOSIS

**Too much acid build up** in the body

**INCREASE IN HYDROGEN IONS**

**↓ HCO3 GOES DOWN** <22

**↓ PH GOES DOWN** <7.35

Lungs try to compensate **by blowing off CO2 by breathing faster** to bring pH back to normal

### CAUSES

**ANYTHING THAT CAUSES ↑ ACID PRODUCTION**

- Malnutrition
- DKA
- Sepsis (↑ lactic acid)
- Alcoholism

BREAKDOWN OF FATS → EXCESS KETONES (ACIDS)

ACIDS (KETONES) BUILD UP IN THE BODY → BICARB DECREASES

**ANYTHING THAT CAUSES ↓ ACID EXCRETION**

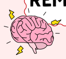
- Renal failure

KIDNEYS UNABLE TO EXCRETE WASTE → BUILDUP OF ACIDS & ↓ BICARB ABSORPTION

**ANYTHING THAT CAUSES EXCESS BICARB LOSS**

- Severe diarrhea

REMEMBER **B**ICARB COMES OUT OF YOUR **BASE**!



### SYMPTOMS

- Kussmaul's respirations
- ↓ BP
- Confusion
- Hypoxia
- Hyperkalemia
  - EKG changes
  - Muscle twitching
  - Weakness

**DEEP, RAPID BREATHING**

Body trying to compensate by blowing off carbon dioxide

### TREATMENT

- Monitor electrolytes & neuro status
- Initiate seizure precautions
- Administer sodium bicarbonate
- Monitor respiratory status (may require intubation if respiratory distress becomes severe)
- May require dialysis if from renal failure to remove toxins

**DIABETIC KETOACIDOSIS (DKA)**

Buildup of **ketones** (acids) in the body

- Give regular insulin; stops breakdowns of fats which stops ketone production
- Watch K+ levels closely! As acidosis is corrected K+ shifts back into cells causing hypokalemia

### METABOLIC ALKALOSIS

**Too little acid** or **too much bicarb** in the body

**NOT ENOUGH HYDROGEN IONS**

**↑ HCO3 GOES UP** >26

**↑ PH GOES UP** >7.45

Lungs try to compensate by **breathing slower to retain CO2** to bring pH back to normal

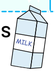
### CAUSES

**ANYTHING THAT CAUSES EXCESS LOSS OF ACID**

- Vomiting
- Excessive GI suctioning

**ANYTHING THAT CAUSES EXCESS BICARBONATE**

- Excess sodium bicarbonate administration
- Excessive consumption of alkaline content
  - Antacids
  - Milk
  - Baking soda
- Hyperaldosteronism



causes sodium-hydrogen exchange in kidneys → hydrogen goes **DOWN** bicarb goes **UP**

- Loop diuretics

causes kidneys to release hydrogen through urine → hydrogen goes **DOWN** bicarb goes **UP**

### SYMPTOMS

- < RR (<12)
- Hypokalemia
  - EKG changes
  - Lethargy & irritability
  - Tetany
  - May have + Chvostek's Sign

Higher pH causes more calcium to bind to albumin, leading to **HYPOCALCEMIA**

### TREATMENT

- Antiemetics to stop vomiting **(Zofran)**
- Monitor electrolytes
- IV fluids to replace fluid loss
- Monitor I & O
- Initiate seizure precautions
- Stop loop diuretics
- **Diamox (Carbonic Anhydrase Inhibitor):** diuretic that promotes loss of bicarb through urination

# ARDS (ACUTE RESPIRATORY DISTRESS SYNDROME)

## WHAT IS IT?

Life-threatening lung disease that causes severe damage to the alveoli due to inflammation & pulmonary edema

**ALVEOLI**

Site of gas exchange between 02 & C02

**ARDS IS NOT A PRIMARY LUNG DISEASE**

It is a *complication* from a systemic injury that causes widespread inflammation, damaging the alveoli

## CAUSES

**INDIRECT:** INJURY OUTSIDE THE LUNGS
- Sepsis MOST COMMON
- Pancreatitis
- Drug overdose
- Burns

**DIRECT:** INJURY DIRECTLY TO LUNGS
- Aspiration
- Chest trauma
- Drowning
- Inhalation injury

## PATHO

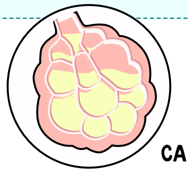
INFECTION/ INJURY CAUSES SEVERE INFLAMMATION

↓

INFLAMMATION CAUSES FLUID BUILD UP

↓

FLUID IN NEARBY CAPILLARIES LEAK INTO ALVEOLI

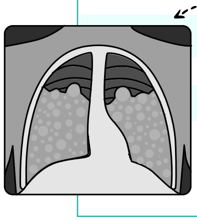


- Alveoli become **filled with fluid**
- Body stops producing **surfactant**, causing alveoli to collapse

CAUSES **IMPAIRED GAS EXCHANGE**

LUNGS BECOME **STIFF** & **NONCOMPLIANT**

## DIAGNOSTICS



- **CHEST X-RAY:** "white out" infiltrates (AKA "ground glass opacities")
- **ABG**
- **BLOOD CULTURES:** assess for infection
- **BRONCHOSCOPY:** may pair with lavage to clean out airways & collect bronchial specimen

## ARDS STAGES

| EXUDATIVE | PROLIFERATIVE | FIBROTIC |
|---|---|---|
| Occurs **4-7 days after injury** | Occurs **7-21 days after injury** | Occurs **>3 weeks after injury** |
| → Damage to capillary membrane leads to **pulmonary edema**<br>→ Decreased surfactant leads to **atelectasis** (alveoli collapse)<br>→ **Hyaline membrane** starts to develop & leads to decreased lung elasticity | → Initiation of lung repair & resorption of edema<br>→ Some patients recover at this phase<br>→ **Patients that do not recover:** lung tissue continues to become more dense & fibrous | → Extensive lung scarring present<br>→ Lungs are very hard & stiff (like cement)<br>→ Alveoli lose inner infrastructure which worsens gas exchange, lung compliance & hypoxemia |
| HALLMARK SIGN **REFRACTORY HYPOXEMIA**<br>Low blood oxygen levels despite receiving high amounts of oxygen<br>**SHORTNESS OF BREATH= EARLIEST SIGN** | **DECREASED LUNG COMPLIANCE**<br>Lungs continue to become **stiffer**, worsening hypoxemia | **VERY POOR PROGNOSIS**<br>Patient is ventilator dependent at this point with a very low chance of recovery |

## TREATMENT

**MEDICATIONS**
- **Antibiotics:** treat/ prevent infection
- **Corticosteroids:** ↓ inflammation
- **Diuretics:** ↓ pulmonary edema
- **Inhaled vasodilators (nitric oxide):** pulmonary vascular dilation (mainly used as rescue therapy)

**OXYGENATION**
- High flow or BiPAP in early stages
- Most patients require mechanical ventilation
- Paralytics may be needed to allow ventilator to have complete control (requires deep sedation)
- Prone positioning to improve gas exchange
- ECMO may be required in severe cases

## NURSING INTERVENTIONS

**WILL MOST LIKELY REQUIRE ICU CARE**

**CLOSE MONITORING**
- Vital signs & breathing pattern
- ABG & labs
- Strict I & O

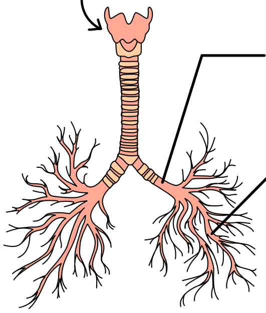
**SUPPORTIVE CARE**
- Q2 turning
- Early feeding (tube feeds)
- DVT prophylaxis & stress ulcer prevention
- VAP bundle care
- Sedation vacations/ weaning as appropriate

# ASTHMA

## WHAT IS IT?

Chronic lung disease that causes inflammation & narrowing of the airways along with mucous production

**TARGETS BRONCHI & BRONCHIOLES**



### BRONCHI

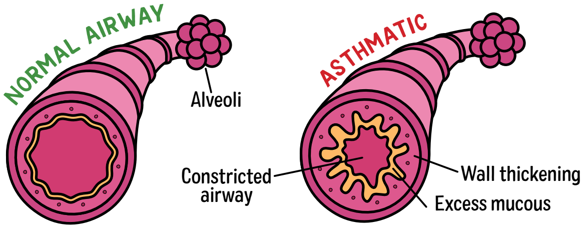
Main airways that branch off of trachea

### BRONCHIOLES

Smallest airways that branch off bronchi

**LEAD TO ALVEOLI**

(WHERE GAS EXCHANGE OCCURS)



### DUE TO INFLAMMATORY RESPONSE

Patient experiences **trigger** that activates **mast cells**, leading to release of **inflammatory mediators** such as:

- Leukotrienes
- Histamines
- Prostaglandins
- Cytokines

Which triggers **INFLAMMATORY CASCADE**

- Hyperresponsiveness
- Mucosal edema
- Mucous production

## RISK FACTORS

- Genetics
- Being overweight
- Smoking or vaping
- Exposure to allergens (mold, chemicals)

## SYMPTOMS

- Chest tightness
- Dyspnea (shortness of breath)
- Wheezing on **exhalation**
- Retraction on **inhalation**
- Cough
- Tachypnea
- Tachycardia
- Anxiety

## TRIGGERS

Stimuli that provoke the exacerbation of asthma symptoms

**ENVIRONMENT**

- Smoke, pollen, perfume
- Cool or dry air

**STRESS**

- Exercise
- Emotional upset

**MEDICAL ILLNESSES**

- Respiratory infection
- GERD

**MEDICATIONS**

- NSAIDs & Aspirin
- Beta Blockers (non-selective)

Causes bronchospasm!

## STATUS ASTHMATICUS

Life threatening complication of asthma where airway obstruction is not responsive to traditional treatment

**SYMPTOMS:**

- Severely labored breathing
- Inability to speak
- Decreased LOC
- Cyanosis

**TREATMENT:**

- Oxygen
- IV fluids
- Bronchodilators (Albuterol)
- Corticosteroids
- Epinephrine

IF NOT TREATED PROMPTLY CAN LEAD TO
**CARDIAC OR RESPIRATORY ARREST**

## TREATMENT

**NO CURE BUT CAN BE CONTROLLED**

**RESCUE DRUGS**

- Albuterol (SABA)
- Ipratropium (Anti-cholinergic)

**BRONCHODILATORS**
Relax smooth muscle to open airways quickly

**LONG TERM MANAGEMENT**

- Inhaled corticosteroids
  - **-ASONES & -IDES**
  - **EX:** Fluticasone & Budesonide

Educate patient to **rinse mouth after** to avoid thrush

- Leukotriene modifiers
  - **-LUKAST**
  - **EX:** Montelukast
- Long Acting Bronchodilators (LABA)
  - **-TEROL**
  - **EX:** Salmeterol

## NURSING INTERVENTIONS

- Administer oxygen
- High Fowler's position
- Maintain patent airway
- Promote calm environment

**MONITOR**

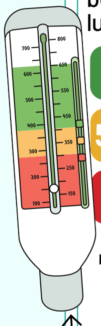
- Vital signs
- Work of breathing
- Lung sounds

**EDUCATE**

- Avoid triggers
- Importance of medication compliance
- Always carry rescue drugs
- Take SABA before exercise (if trigger)
- How to use **peak flow meter**

## PEAK FLOW METER

Measures how fast air can be forcefully expelled from lungs



- >80% = GOOD
- 50–80% = CAUTION
- <50% = ALERT

- Establish personal best baseline reading first for comparison
- Used **before** medication
- Patient exhales as hard as they can to get reading

Helps determine how **well controlled asthma is** & if it's **GETTING WORSE**

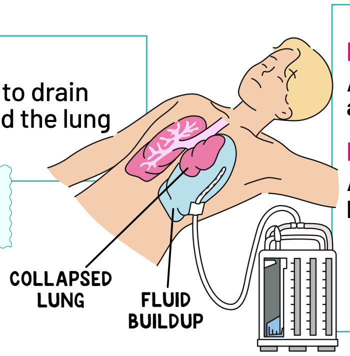
# CHEST TUBES

## WHAT IS IT?

Tube that is inserted into the pleural space to drain fluid or air to relieve pressure and re-expand the lung

### ★ INSERTION SITE

4th or 5th intercostal space in the mid or anterior axillary line


COLLAPSED LUNG
FLUID BUILDUP

## INDICATIONS

**PNEUMOTHORAX**
Abnormal collection of **air** in the pleural cavity

**HEMOTHORAX**
Abnormal collection of **blood** in the pleural cavity

**EMPYEMA**
Infected, purulent fluid in pleural cavity

**PLEURAL EFFUSION**
Build up of fluid in pleural cavity

**POST-OP**
After cardiac surgery to drain fluid

**PLEURAL CAVITY**
Space between chest wall and lungs

## CHEST TUBE CHAMBERS

### DRAINAGE CHAMBER

Collects & drains blood into calibrated chamber in order to measure amount of drainage

**MONITOR COLOR & AMOUNT**
Sudden bright red blood or drainage >100 mL/ hour should be reported to PCP

### WATER SEAL CHAMBER

One-way valve that allows air to exit pleural cavity on exhalation & prevents air entering on inhalation

**Continuous** bubbling is **ABNORMAL**
→ indicates air leak

**Intermittent** bubbling is **NORMAL**
→ **CALLED TIDALING:** Up & down movement of water with inhalation & exhalation

**IF TIDALING STOPS:** Means lung re-expanded (good) or blockage in system (bad)

### SUCTION CONTROL CHAMBER

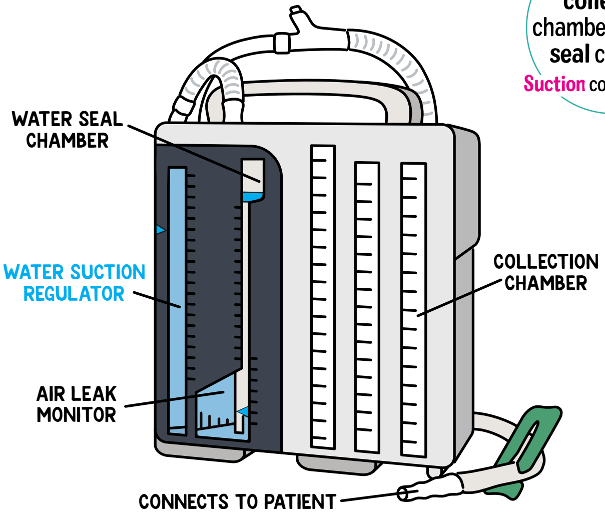
Regulates the amount of suction transmitted to the pleural space

Gentle bubbling in **wet suction** is **NORMAL**
→ means the suction is working!

**Dry suction DOES NOT** have water suction chamber (uses suction control dial)

## WET SUCTION

Suction regulated by the **height of a column of water**

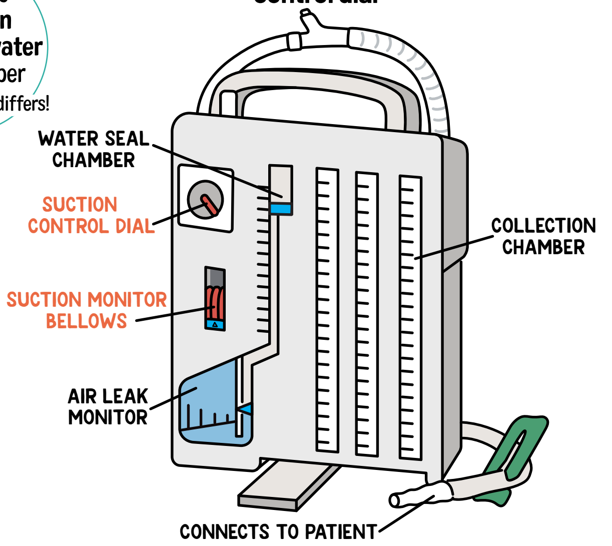

WATER SEAL CHAMBER
WATER SUCTION REGULATOR
AIR LEAK MONITOR
COLLECTION CHAMBER
CONNECTS TO PATIENT

Monitor **WATER LEVEL** (water will evaporate & needs to be refilled)

Both have **collection** chamber & **water seal** chamber
**Suction** control differs!

## DRY SUCTION

Suction regulated by **suction control dial**


WATER SEAL CHAMBER
SUCTION CONTROL DIAL
SUCTION MONITOR BELLOWS
AIR LEAK MONITOR
COLLECTION CHAMBER
CONNECTS TO PATIENT

Monitor **SUCTION BELLOWS** to ensure suction is working

## NURSING INTERVENTIONS

- → Always keep chest tube below site of insertion
- → **Do not** strip or clamp tubing unless ordered by MD
- → Encourage coughing & deep breathing from patient
- → Monitor lung sounds & insertion site
- → Monitor color & amount of drainage
- → Educate to do valsalva maneuver when PCP removing chest tube

### WHEN TO NOTIFY MD:

- ▸ Subcutaneous emphysema is noted (popping sensation in skin when palpated)
- ▸ Bright red blood appears
- ▸ >100 mL of output per hour

### IF CHEST TUBE FALLS OUT

Immediately cover insertion site with sterile gauze

### IF SYSTEM GETS DAMAGED

Insert tubing into sterile water to maintain water seal

# COPD (CHRONIC OBSTRUCTIVE PULMONARY DISEASE)

## WHAT IS IT?

Group of chronic & progressive inflammatory lung diseases that cause obstructed air flow in the lungs

**DAMAGE FROM COPD IS IRREVERSIBLE**

Patients usually have combination of symptoms from **EMPHYSEMA** & **CHRONIC BRONCHITIS** leading to:

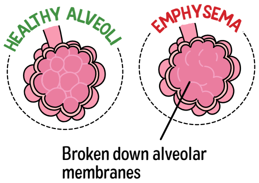
Air flow obstruction (CHRONIC BRONCHITIS) & inability to fully exhale (EMPHYSEMA)

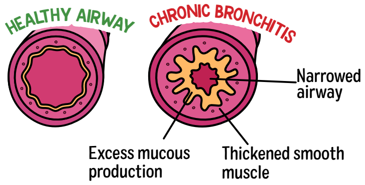
**MADE UP OF TWO DISEASES:**

**EMPHYSEMA** & **CHRONIC BRONCHITIS**

**EMPHYSEMA**: Damage & rupture to inner structure of **alveoli**

**CHRONIC BRONCHITIS**: Inflammation of the lining of the **bronchial tubes**





## RISK FACTORS

**CAUSED BY IRRITANT EXPOSURE TO LUNGS**

- Smoking **MOST COMMON**
- Genetics → **ALPHA1-ANTITRYPSIN DEFICIENCY** (PROTECTS LINING OF LUNGS)
- Frequent respiratory infections as child
- Age over 65 years old
- Asthma
- Frequent exposure to chemicals/ pollution

## DIAGNOSTICS

- Chest x-ray
- Arterial blood gas → ↑ CO2 ↓ O2
- Pulmonary Function Test: Spirometry
  - Patient breathes into tube connected to computer to measure different volumes during breathing

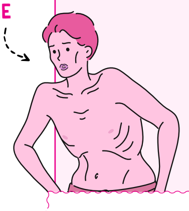
**FEV1/ FVC RATIO <70% indicates obstructive lung disease**

| FVC | FEV1 |
|---|---|
| **FORCED VITAL CAPACITY**<br>Amount of air patient can forcibly exhale after taking deepest inhale | **FORCED EXPIRATORY VOLUME**<br>Amount of air patient can forcibly exhale from lungs in first second |

## SYMPTOMS

### EMPHYSEMA

**"PINK PUFFER"**



WILL TRIPOD TO GET AIR EXCHANGE

Experience **air trapping** due to loss of lung elasticity

- Pink skin
- Pursed lip breathing
- Barrel chest
- Tachypnea & dyspnea
- Cachexia
- Minimal cough

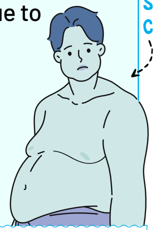
★ **1ST SIGN:** Shortness of breath & fatigue

### CHRONIC BRONCHITIS

**"BLUE BLOATER"**

Experience **cyanosis** due to airflow obstruction

- Cyanosis
- Peripheral edema
- Obese
- Chronic productive cough
- Crackles & wheezes
- Recurrent infections



LEADS TO RIGHT SIDED HEART FAILURE CAUSING **EDEMA**

★ **1ST SIGN:** Productive cough >3 months x 2 years

## TREATMENT

**NO CURE: FOCUSED ON SYMPTOM MANAGEMENT**

**MEDICATIONS**

1. **Bronchodilators:** dilate airways
   - **-TEROL** Ex: Salmeterol & Albuterol
2. **Corticosteroids:** ↓ inflammation
   - **-SONE** Ex: Prednisone & Hydrocortisone

**TAKE IN THIS ORDER!** Open airways **first** so steroids can work

**PULMONARY REHAB**

- Breathing techniques
- Exercise training
- Nutritional counseling

## NURSING INTERVENTIONS

**CLOSE MONITORING**

- Monitor O2 sat
- ABG's
- Lung sounds
- Secretions

**GIVE O2 WITH CAUTION** ⚠

Patient at risk for **hypercapnia**, O2 is given in low amounts with target **SPO2 between 88-92%**

**EDUCATION**

- Smoking cessation
- Effective breathing & coughing
- Stay up to date on vaccines
- Avoid irritants to ↓ exacerbations
  (Smoke, very hot or very cold weather, sick people)

**DIET**

- Small, frequent meals
- ↑ calorie ↑ protein
- Stay hydrated

# PNEUMOTHORAX vs HEMOTHORAX

## WHAT IS IT?

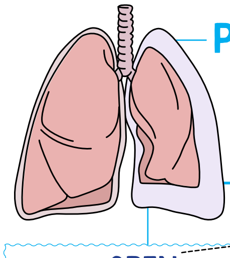
Conditions that cause a build up of air or blood in the **PLEURAL SPACE** surrounding the lungs

## PLEURAL SPACE

Space between **visceral pleura** (lining of lungs) & **parietal pleura** (lining of chest cavity)

**MAINTAINS NEGATIVE PRESSURE ENVIRONMENT**

When air or blood enters the space, it disrupts the negative pressure, which can cause lung to **collapse**



## PNEUMOTHORAX

**Air** leakage into pleural space

### CAUSES

CAN LEAD TO

#### OPEN

Air enters pleural space from **outside** opening

- Gunshot
- Stabbing

SUCKING CHEST WOUND

**TREATMENT**

Place sterile occlusive dressing over wound taped on **three sides**

Prevents **TENSION PNEUMO**

#### CLOSED

Air enters pleural space **without outside opening**

- Rib fracture
- **Spontaneous pneumo** (Rupture of bleb)

**PRIMARY**

No history of lung disease

**SECONDARY**

History of lung disease

#### TENSION ⚠

Air can't escape causing ↑ pressure in thoracic cavity

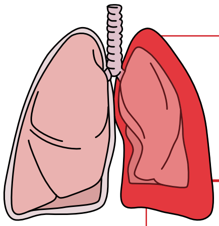
- ↑HR ↑RR
- ↓BP ↓O2
- Tracheal deviation

**TREATMENT**

Needle decompression

### SYMPTOMS

- Dyspnea
- Absent lung sounds on affected side
- **Hyperresonance on percussion**
- Subcutaneous emphysema
  (Popping sensation under skin when palpated)
- Unequal chest expansion
- Tachycardia & hypoxia



## HEMOTHORAX

**Blood** leakage into pleural space

### CAUSES

- Pulmonary embolism
- Thoracic surgery

**PENETRATING CHEST TRAUMA**

- Puncture from broken rib
- Gunshot wound
- Stab wound

**BLUNT FORCE TRAUMA**

- Car accident
- Fall

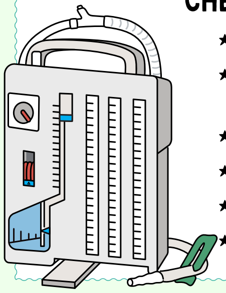
### SYMPTOMS

- Dyspnea
- Absent lung sounds on affected side
- **Dullness on percussion**
- Bloody, frothy sputum
- Hypotension
- Unequal chest expansion
- Tachycardia & hypoxia

## TREATMENT (FOR BOTH)

**PROCEDURES**

- **Chest tube insertion:** drain fluid or air to re-expand lung
- **Thoracentesis:** Needle inserted into chest cavity to drain air/ fluid
  (Chest tube may be placed after)
- **Thoracotomy:** Incision made in chest wall to remove blood/ air in pleural space
  (In more severe cases)



**CHEST TUBE PLACEMENT**

- ★ Have suction tubing ready
- ★ Provide analgesic prior to procedure if ordered
- ★ Provide supplemental oxygen
- ★ Chest x-ray to verify placement
- ★ Monitor VS per policy after procedure
- ★ Keep occlusive dressing over site

## NURSING INTERVENTIONS

**MONITOR**

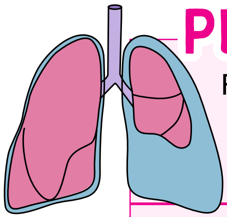
- Vital signs
- Chest tube insertion site
- Lung sounds

**MONITOR CHEST TUBE FOR:**

- Air leaks
- Color & amount of output
- Water level/ suction bellows to ensure suction level is adequate

- Encourage to cough & deep breath
- Teach to splint area while coughing
- Reposition to promote drainage
- Encourage ambulation (with MD order)

# PLEURAL EFFUSION vs PULMONARY EDEMA



## PLEURAL EFFUSION

Fluid build-up in the **pleural cavity**

Space between lungs & chest cavity where (-) pressure is maintained for lung inflation

### CAUSES

**TRANSUDATIVE EFFUSION**

Watery fluid due to pressure build up & backflow into lungs

- Heart failure
- Nephrotic syndrome
- Liver cirrhosis

**EXUDATIVE EFFUSION**

Protein rich fluid due to inflammation of capillaries causing them to leak

- Pneumonia
- Cancer
- Pulmonary embolism
- Post open-heart surgery

### SYMPTOMS

- Dry, non-productive cough
- Dyspnea
- Chest pain
- Tactile Fremitus
  (palpable vibration of chest wall during speech)
- Tachycardia
- Pleuritic chest pain (sharp pain w/ deep breath)

**SMALL EFFUSIONS MAY NOT HAVE SYMPTOMS**

Will only be assessed on chest x-ray

**COMPLICATION:**

**EMPYEMA**

Infected fluid in the pleural space can develop into pus-filled pockets

- Fever & chills
- Pleuritic chest pain (worsens on inhale)
- Shortness of breath

### TREATMENT

**PROCEDURES**

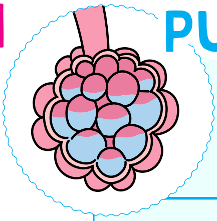
- Thoracentesis or chest tube
- **Pleurodesis:** Chemical used to bind visceral & parietal lining together
  (for severe & recurrent cases)

**MEDICATIONS**

- Antibiotics (if due to infection)
- Diuretics (if due to CHF)

**NURSING CARE**

- Keep HOB elevated 30 degrees
- Monitor VS & respiratory status
- Supplemental oxygen as needed



## PULMONARY EDEMA

Fluid build-up in the **alveoli**

Tiny air sacs at end of bronchioles where gas exchange takes places

### CAUSES

**CARDIOGENIC**

Inadequate pumping of heart

- Left-sided heart failure
- Myocardial infarction
- Cardiomyopathy

**NON-CARDIOGENIC**

Damage to the lungs

- ARDS
- Pneumonia
- Inhalation of toxins
- Sepsis

(↑ capillary permeability)

### SYMPTOMS

- Pink & frothy sputum
- Shallow, rapid breathing
- Orthopnea (SOB when lying flat)
- Crackles
- Percussed dullness over affected area
- Anxiety or decreased LOC
- Substernal retractions during respiration

**COMPLICATION:**

**FLASH PULMONARY EDEMA**

Fluid acutely shifts from pulmonary vasculature into alveoli

| SYMPTOMS: | TREATMENT: |
|---|---|
| ▸Extreme SOB | ▸100% non-rebreather |
| ▸Severe crackles | ▸Diuretics |
| ▸↑ BP ↑ HR ↑ RR | ▸Nitro |

**MEDICAL EMERGENCY** ⚠

### TREATMENT

- High fowler's position
- Supplemental oxygen as needed
- Prepare for need for BiPAP & possible intubation
- Monitor VS, LOC & respiratory effort
- Strict I & O
- Daily weights

**MEDICATIONS**

- **Positive inotropes:** improve contractility
  (Dobutamine)
- **Diuretics:** remove excess fluid
- **Nitroglycerin:** reduce preload in heart

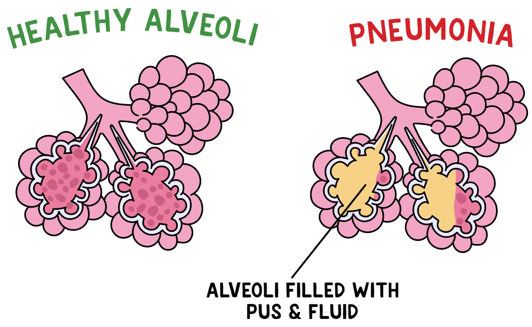
# PNEUMONIA

## WHAT IS IT?

Inflammation of lung tissue due to infection caused by bacteria, viruses, or fungi

Germs enter lungs through **inspiration**, aspiration, **direct contact**, or blood

Alveoli become inflamed & fill with pus & fluid
**LEADING TO IMPAIRED GAS EXCHANGE**



## TYPES OF PNEUMONIA

| COMMUNITY-AQUIRED | HOSPITAL-AQUIRED | VENTILATOR-ASSOCIATED | ASPIRATION |
|---|---|---|---|
| Acquired **outside** of hospital (in the community)<br>Most common cause: STREPTOCOCCUS PNEUMONIAE | Acquired **inside** of hospital<br>↳Patient must have been admitted >48 hours<br>MORE RESISTANT TO ANTIBIOTICS | Acquired after being placed on **mechanical ventilation**<br>(must have been intubated >48 hours) | Inhalation of fluid, food, or secretions into airway<br>↳Can occur in community or hospital |

## RISK FACTORS

- Smokers
- Prior infection
- Surgery/ post-op
- Immobility
- Chronic lung disease
- Immunocompromised
  - Very young & very old
  - HIV
  - Autoimmune disease

## SYMPTOMS

- Flu-like symptoms
  - Fever & diaphoresis
  - Chills
  - Muscle aches
  - ↓ appetite
- Abnormal breath sounds (coarse crackles & rhonchi)
- Hypoxia
- ↑ HR ↑ RR
- Productive cough
- ↑ WBC ↑ CO2
- Neuro changes (especially in elderly)
  - MAY BE ONLY PRESENTING SIGN

## DIAGNOSTICS

- **CHEST X-RAY:** will show pulmonary infiltrates
- **LABS:** will show elevated WBC
- **SPUTUM CULTURE:** determine causative agent

Bacterial & viral pneumonia are **CONTAGIOUS**

Fungal pneumonia is **NOT CONTAGIOUS**

## INTERVENTIONS

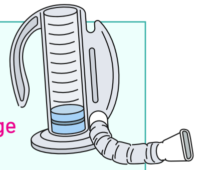
### MEDICATIONS

- **Antibiotics:** if bacterial cause
- **Antivirals:** if viral cause
- **Antipyretics:** reduce fever
- **Nebulizers:** loosen secretions

### NURSING CARE

- Monitor VS & respiratory status
- Chest percussion to mobilize secretions
- Keep HOB elevated 30 degrees
- Supplemental oxygen as needed
- Monitor color & consistency of secretions
- Suction as needed

## EDUCATION



- Encourage use of incentive spirometer
  ↳Helps pop open alveoli & improve gas exchange
- Encourage frequent position changes for postural drainage
- Don't stop antibiotics in middle of treatment (even if feeling better)

### PREVENTION

- Good hand hygiene
- Stay up to date on vaccines
- Avoid sick people
- Smoking cessation

### DIET

- Small, frequent meals
- High protein
- High calories
- Encourage fluids (unless restricted due to CHF)

# PULMONARY EMBOLISM

## WHAT IS IT?

Blood clot that blocks a blood vessel in the lung (usually pulmonary artery), obstructing blood flow

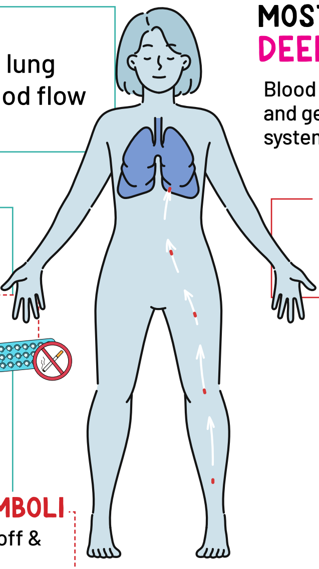
**MEDICAL EMERGENCY** ⚠

## RISK FACTORS

- → Recent surgery
- → Arrhythmias (afib)
- → Obesity
- → Smoking
- → Oral contraceptives
  (containing estrogen & progesterone)
- → Immobility
  (long flights or bed-bound)
- → Long bone fracture
  (most common in **femur**)

Birth control + smoking
**=VERY HIGH RISK!**

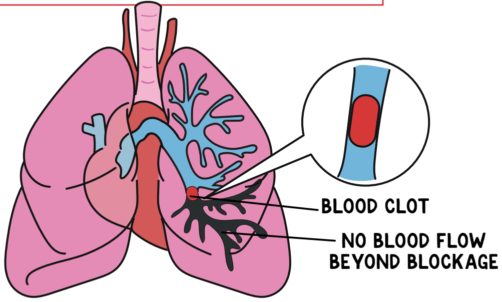
Can lead to **FAT EMBOLI**
Fat particle breaks off & travels to lungs



**MOST COMMON CAUSE:**
**DEEP VEIN THROMBOSIS (DVT)**

Blood clot forms in one of the lower extremities and gets dislodged & travels up the vascular system & **becomes lodged in the lungs**

Leads to:
**IMPAIRED CIRCULATION &**
**IMPAIRED GAS EXCHANGE**



## SYMPTOMS

- → Shortness of breath
- → Anxiety
- → Tachycardia
- → Tachypnea
- → Chest pain with inspiration
- → Hypotension
- → Diaphoresis
- → Sudden change in mental status

Feeling of
**IMPENDING DOOM**

## DIAGNOSTICS

- → **CT angiogram** (CT w/ contrast) **GOLD STANDARD**
- → **D-dimer:** will be elevated for (+) PE
  (NOT DEFINITIVE; must get CT scan if elevated)

### IF NOT TREATED PROMPTLY CAN LEAD TO:

- ▸ Respiratory failure
- ▸ Cor pulmonale
- ▸ Cardiac arrest
- ▸ Sudden death

**REQUIRES IMMEDIATE INTERVENTION!**

## TREATMENT

### MEDICATIONS

- → **Anticoagulants:** prevent clot from getting bigger & formation of new clots
  **HEPARIN:** monitor aPTT | **COUMADIN:** monitor INR
- → **Thrombolytics:** dissolve clot
  ↳ **ALTEPLASE**
  (used in more severe cases)

### PROCEDURES

- → **Thrombectomy:** surgical removal of blood clot
- → **IVC Filter:** filter inserted into vein to stop clots from traveling up to lungs

## NURSING INTERVENTIONS

### MONITOR

- → Vital signs
- → Respiratory status
- → Anticoagulation/ thrombolytic therapy
- → Signs of excessive bleeding
  - ▸Bleeding gums
  - ▸Bloody nose
  - ▸Hematuria

### OXYGENATION

- → Adminsiter oxygen as needed
- → Reposition frequently to promote gas exchange
- → Elevate head of bed for maximum lung expansion

### DVT PREVENTION

- ▸ Early ambulation
- ▸ ROM exercises if immobile
- ▸ Compression stockings
- ▸ Avoid crossing legs

### BLEEDING PRECAUTIONS

- ▸ Soft toothbrush only
- ▸ Electric razor to shave
- ▸ Do NOT take aspirin
- ▸ Fall prevention

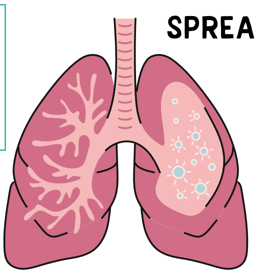
# TUBERCULOSIS

## WHAT IS IT?

Bacterial infection caused by **mycobacterium tuberculosis** that mainly affects the lungs

### CAN ALSO AFFECT:

- Brain
- Kidneys
- Spine
- Lymph nodes
- Liver
- Joints



**SPREADS THROUGH AIRBORNE DROPLETS**

(Coughing, talking & sneezing)

Bacteria enters lungs & adheres to alveoli & triggers immune response that causes **granulomas** (lesions) in lungs

## RISK FACTORS

- → TB exposure/ history
- → Alcohol/ drug abuse
- → Workers in healthcare facilities
- → Immunosuppression (HIV/AIDS)
- → Living in overcrowded area

## SYMPTOMS

★ Usually asymptomatic until infection becomes ACTIVE

- → Cough lasting >3 weeks
- → Blood tinged sputum
- → Night sweats
- → Fever
- → Unintended weight loss
- → Chest pain
- → Loss of appetite

## TREATMENT

**REMEMBER PERI: MEDICATIONS**

- ★ **P**yrazinamide
- ★ **E**thambutol
- ★ **R**ifampin
- ★ **I**soniazid

1ST LINE TREATMENT

① **Pyrazinamide:** can cause liver damage
**EDUCATION:** No alcohol & monitor for jaundice

② **Ethambutol:** can cause optic neuritis
**EDUCATION:** Need to have frequent vision exams

③ **Rifampin:** turns urine & secretions orange
**EDUCATION:** Monitor for signs of liver damage

④ **Isoniazid:** lowers B6 levels (can cause peripheral neuropathy)
**EDUCATION:** Supplement B6 & monitor for liver damage

### MEDICATION REGIMEN

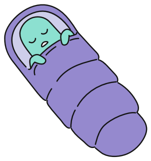
Requires patient to take up to 4 of the meds for 6-12 months

**MEDICATION COMPLIANCE IS CRUCIAL TO TREATMENT**

↳ CDC recommends **DOT** (**D**irectly **O**bserved **T**herapy) for all TB patients where trained person observes patient swallowing meds

## THERE ARE TWO TYPES OF TUBERCULOSIS:

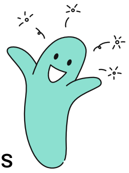
### LATENT



- Inactive infection (bacteria is encapsulated)
- Asymptomatic
- Not contagious

### ACTIVE

- Active infection
- Positive symptoms
- Contagious to others



**BOTH REQUIRE TREATMENT**

Latent TB can **become** active if not treated

## DIAGNOSTICS

→ **MANTOUX TEST (PPD):** Intradermal injection read within 48-72 hours to check for **induration** at site

**CONSIDERED POSITIVE IF:**

| | |
|---|---|
| **›5MM** | Immunocompromised |
| **›10MM** | People in high risk settings or conditions for TB |
| **›15MM** | Everyone |

**REASONS FOR POSITIVE MANTOUX:**

- →Active TB infection
- →Previous TB exposure
- →BCG vaccine (international countries)

→ **ACID FAST BACILLI:** Sputum samples taken to identify mycobacterium (usually 3 samples collected)

→ **QUANTIFERON GOLD:** Blood sample to test for mycobacterium (does not differentiate b/w latent & active)

→ **CHEST X-RAY:** Assess for lesions in lungs
(positive Mantoux test requires chest x-ray follow up)

## NURSING INTERVENTIONS

**AIRBORNE PRECAUTIONS IN NEGATIVE PRESSURE ROOM**

- → Monitor VS & I&O
- → Promote coughing & deep breathing
- → Encourage activity & adequate nutrition

### EDUCATION

- Avoid large crowds or enclosed spaces with other people
- Wear mask when around others
- Encourage family members to get screened as well
- Stress importance of completing treatment
- Avoid alcohol & acetaminophen
- Encourage adequate nutrition and hydration

# UPPER RESPIRATORY DISORDERS

## WHAT ARE THEY?

Infections of the upper airway that result in **local inflammation & irritation**

Are usually self limiting & only require supportive treatment

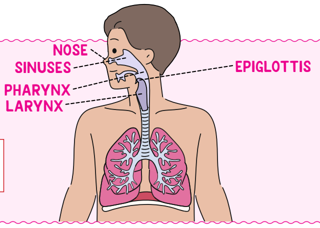
## UPPER RESPIRATORY TRACT

Structures of the respiratory system **outside** of the chest cavity

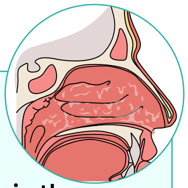
**INCLUDES:**

- ⋆ Nose
- ⋆ Sinuses
- ⋆ Pharynx
- ⋆ Larynx
- ⋆ Epiglottis
- ⋆ Tonsils

**ITIS= INFLAMMATION**



## RHINITIS



Irritation & inflammation of the **mucous membranes in the nose**

### SYMPTOMS

- Nasal congestion
- Sneezing
- Clear nasal discharge
- Runny nose

### TREATMENT

- Nasal saline sprays
- Anti-histamines
- Decongestants
- Corticosteroids

## SINUSITIS

Inflammation of the tissue lining of the **sinuses**

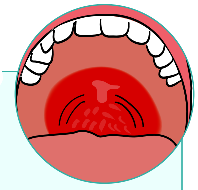
### SYMPTOMS

- Runny nose
- Headache
- Sore throat
- Post-nasal drip
- Bad breath
- Facial pressure

### TREATMENT

- Fluids to loosen secretions
- OTC analgesics for pain
- Nasal saline rinse
- Decongestants

## PHARYNGITIS



Inflammation of the **pharynx (throat)**

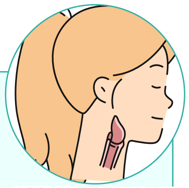
### SYMPTOMS

- Sore throat
- Pain with swallowing
- Sore/ swollen glands
- Hoarse voice

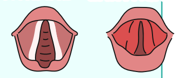
### TREATMENT

- Throat lozenges
- Fluids
- Salt water gargle
- OTC analgesics for pain

## LARYNGITIS



Inflammation of the **larynx (voice box)**



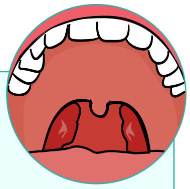
### SYMPTOMS

- Hoarseness
- Sore throat
- Dry Cough
- Loss of voice

### TREATMENT

- Rest voice
- Fluids
- Avoid smoking
- OTC analgesics for pain

## TONSILITIS



Inflammation of the **tonsils**

### SYMPTOMS

- Sore throat
- Difficulty swallowing
- Swollen tonsils
- Fever

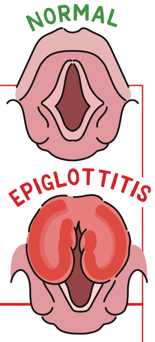
### TREATMENT

- Hydration
- Antipyretics
- OTC analgesics for pain

May require **TONSILLECTOMY** for frequent episodes

MEDICAL EMERGENCY ⚠

## EPIGLOTTITIS



Acute inflammation of the **epiglottis**

Most common cause:
**HAEMOPHILUS INFLUENZAE**

### SYMPTOMS

- Fever **1ST SYMPTOM**
- Difficulty swallowing
- Drooling
- Respiratory distress

### TREATMENT

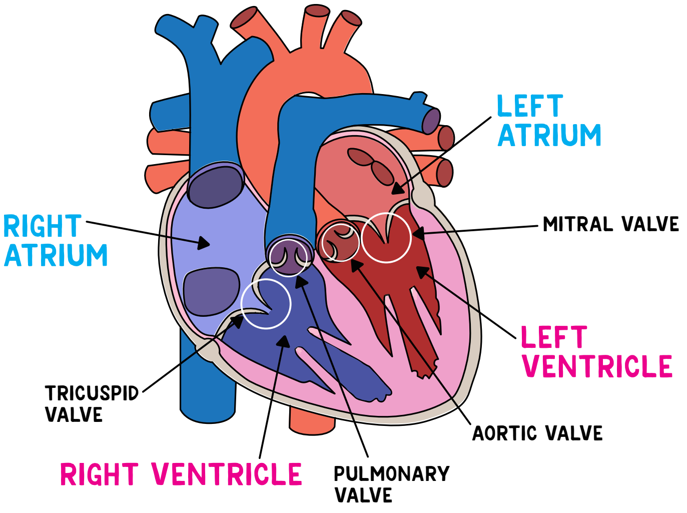
- 100% humidified oxygen
- No oral exams (may cause bronchospasm)
- Emergency intubation may be necessary

Can block airway if swelling becomes severe

# CARDIAC

# CARDIAC SYSTEM OVERVIEW

THERE ARE **4 CHAMBERS** OF THE HEART:


LEFT ATRIUM
RIGHT ATRIUM
MITRAL VALVE
LEFT VENTRICLE
TRICUSPID VALVE
AORTIC VALVE
RIGHT VENTRICLE
PULMONARY VALVE

## ATRIUMS : BLOOD RECIEVERS

**RIGHT ATRIUM:** receives blood from **body**
**LEFT ATRIUM:** receives blood from **lungs**

## VENTRICLES : BLOOD PUMPERS

**RIGHT VENTRICLE:** pumps blood to **lungs**
**LEFT VENTRICLE:** pumps blood to **body**

## VALVES: prevent backflow

### ATRIOVENTRICULAR VALVES

Prevent backflow from **ventricles to atriums**

**TRICUSPID VALVE**
Between right atrium & right ventricle

**MITRAL VALVE**
Between left atrium & left ventricle

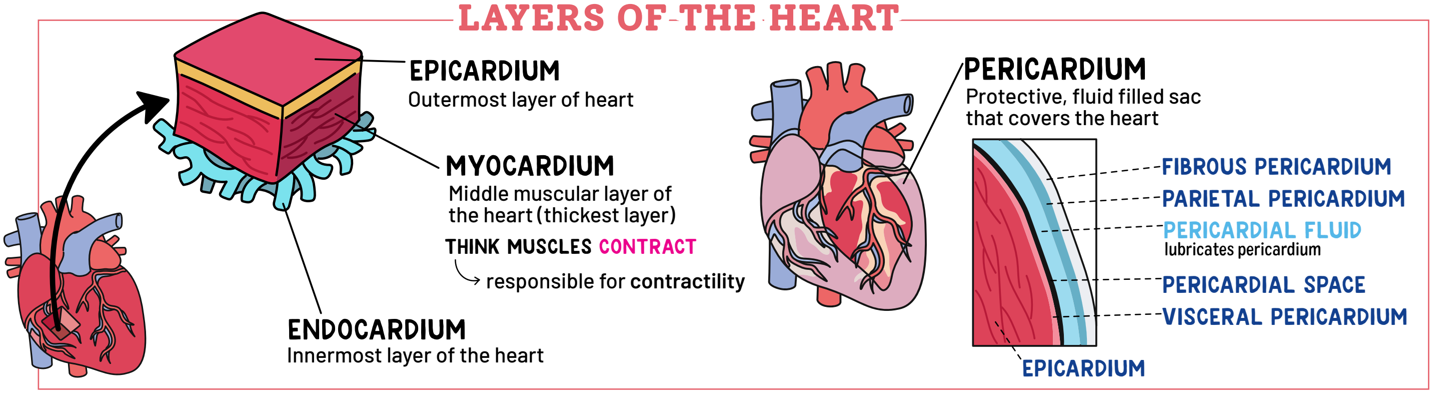
### SEMILUNAR VALVES

Prevent backflow from **arteries to ventricles**

**PULMONARY VALVE**
Between right ventricle & pulmonary artery

**AORTIC VALVE**
Between left ventricle & aorta

## LAYERS OF THE HEART



**EPICARDIUM**
Outermost layer of heart

**MYOCARDIUM**
Middle muscular layer of the heart (thickest layer)
THINK MUSCLES CONTRACT
→ responsible for **contractility**

**ENDOCARDIUM**
Innermost layer of the heart

**PERICARDIUM**
Protective, fluid filled sac that covers the heart

FIBROUS PERICARDIUM
PARIETAL PERICARDIUM
PERICARDIAL FLUID
lubricates pericardium
PERICARDIAL SPACE
VISCERAL PERICARDIUM
EPICARDIUM

## CARDIAC TERMS

### CARDIAC OUTPUT (CO)

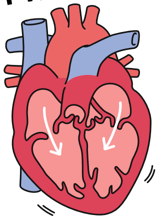
Amount of blood ejected from the heart in one full minute

**NORMAL CO: 4-8L/ MIN**

FORMULA:

**HR** x **SV** = **CO**
Heart Rate x Stroke Volume = Cardiac Output

### PRELOAD



Amount of blood in the ventricles before contracting

### STROKE VOLUME (SV)

Amount of blood ejected from the heart in each beat

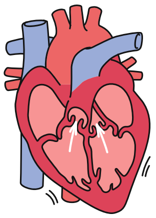
**NORMAL SV: 50-100 ML/ MIN**

### HEART RATE (HR)

Amount of time heart beats per minute

**NORMAL HR: 60-100 BPM**

### AFTERLOAD



Resistance the left ventricle must overcome to pump out blood into circulation

### EJECTION FRACTION (EF)

Amount of blood pumped out from left ventricle with each contraction

**NORMAL EF: 50-70%**

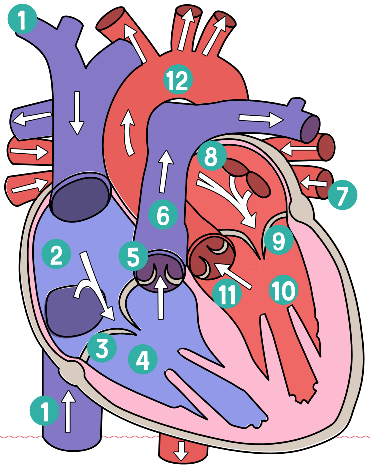
### CONTRACTILITY

Force and strength of contraction of the heart muscle

↑ CONTRACTILITY = ↑ SV
A stronger heart contraction causes more blood output

# CARDIAC FUNCTIONING

## BLOOD FLOW THROUGH THE HEART



### RIGHT

**DEOXYGENATED BLOOD**

① SVC/IVC
② Right Atrium
③ Tricuspid Valve
④ Right Ventricle
⑤ Pulmonic Valve
⑥ Pulmonary Artery

Blood to **LUNGS**

### LEFT

**OXYGENATED BLOOD**

⑦ Pulmonary Vein
⑧ Left Atrium
⑨ Mitral/Bicuspid Valve
⑩ Left Ventricle
⑪ Aortic Valve
⑫ Aorta

Blood to **BODY**

## BLOOD VESSELS

### ARTERIES

Carry **oxygenated** blood from heart to tissues

**THINK A FOR AWAY**

### VEINS

Carry **deoxygenated** blood to heart

**THINK V FOR VISIT**

### EXCEPTIONS

**PULMONARY ARTERY**
Carries **deoxygenated** blood from the heart to the lungs

**PULMONARY VEIN**
Carries **oxygenated** blood from the lungs to the heart

## CONDUCTION SYSTEM

Electrical impulses generated to regulate heart muscle contraction

**REPOLARIZATION= RELAX**

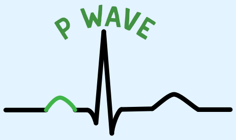
**DEPOLARIZATION= CONTRACT**

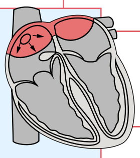
### SA NODE

Sends impulse to contract atrium

**BEATS 60–100 BPM**

**"PACEMAKER" OF THE HEART**





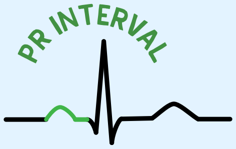
**ATRIAL DEPOLARIZATION STARTS**

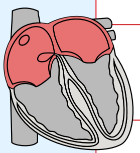
### AV NODE

Creates delay so atria can fully empty into ventricles

**BEATS 40–60 BPM**

**"GATEKEEPER" OF THE HEART**



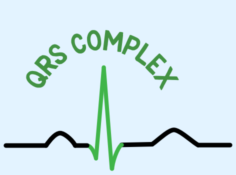


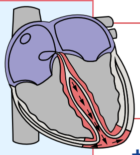
**ATRIAL DEPOLARIZATION COMPLETE**

### BUNDLE OF HIS

Carries impulses from AV node to bundle branches

**BEATS 20–40 BPM**





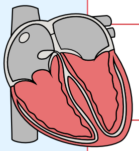
**VENTRICULAR DEPOLARIZATION STARTS**

**+ ATRIAL REPOLARIZATION**

### BUNDLE BRANCHES

Carries impulses to right and left ventricles

**BEATS 20–40 BPM**

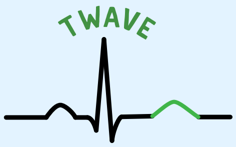


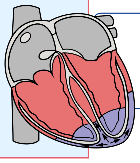
**VENTRICULAR DEPOLARIZATION COMPLETE**

### PURKINJE FIBERS

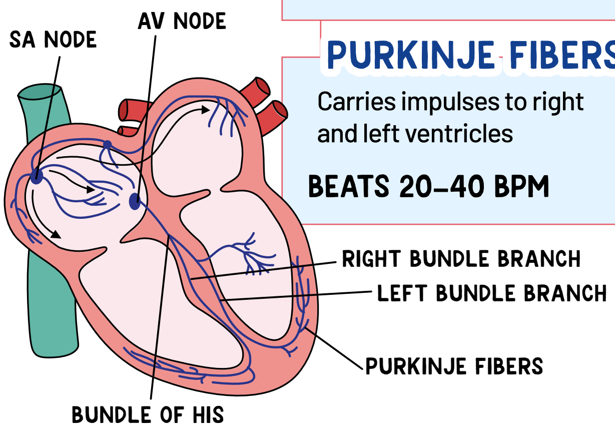
Carries impulses to right and left ventricles

**BEATS 20–40 BPM**



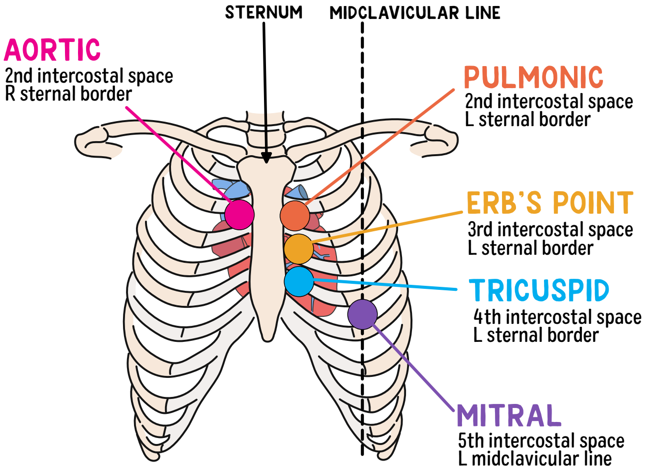


**VENTRICULAR REPOLARIZATION**

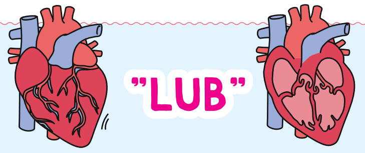


# CARDIAC ASSESSMENT

## AUSCULTATING HEART SOUNDS


STERNUM
MIDCLAVICULAR LINE
AORTIC
2nd intercostal space
R sternal border
PULMONIC
2nd intercostal space
L sternal border
ERB'S POINT
3rd intercostal space
L sternal border
TRICUSPID
4th intercostal space
L sternal border
MITRAL
5th intercostal space
L midclavicular line

**S1**



**Beginning of SYSTOLE**
Ventricles contracting

Closure of **tricuspid** & **mitral** valves

**S2**

**End of DIASTOLE**
Ventricles relaxing

Closure of **aortic** & **pulmonic** valves

### ABNORMAL HEART SOUNDS

| | | | |
|---|---|---|---|
| **S3** | **Rapid ventricular filling** | Sounds like **"lub-dub-ta"** | VENTRICULAR GALLOP |
| **S4** | **Blood forcing into stiff ventricle** | Sounds like **"ta-lub-dub"** | ATRIAL GALLOP |

## CARDIAC MEASUREMENTS

### BLOOD PRESSURE (BP)

Pressure of blood pushing against the walls of the arteries

- **SYSTOLIC BLOOD PRESSURE (SBP)**
  Pressure in the arteries when ventricles **contract**
- **DIASTOLIC BLOOD PRESSURE (DBP)**
  Pressure in the arteries when ventricles **relax**

### MEAN ARTERIAL PRESSURE (MAP)

Average pressure in arteries during one cardiac cycle (systole & diastole)

★ **CONSIDERED BETTER INDICATOR OF PERFUSION TO VITAL ORGANS THAN SYSTOLIC BLOOD PRESSURE**

**NORMAL MAP: 70-100 MMHG**

### FORMULA:

$$MAP = \frac{SBP + (2 \times DBP)}{3}$$

**EXAMPLE**

BP= 97/50

$$\frac{SBP + (2 \times DBP)}{3} = \frac{95 + (2 \times 50)}{3} = \boxed{65}$$

ANSWER 65

## CARDIAC BIOMARKERS

### TROPONIN (TRP)

Proteins released into blood when heart muscle has been damaged

**MOST COMMONLY USED TO DIAGNOSE MI**

**NORMAL: <0.04 NG/ML**

### CREATINE KINASE MYOCARDIAL BAND (CKMB)

Enzyme released into blood following tissue damage to the heart

**NOT AS SPECIFIC AS TROPONIN, PREDICTIVE OF MI**

**NORMAL: <5 NG/ML**

### BRAIN NATRIURETIC PEPTIDE (BNP)

Peptide released from cardiomyocytes when ventricles overfill and stretch

**USED TO DETECT HEART FAILURE**

**NORMAL: <100 PG/ML** | **>900= SEVERE HF**

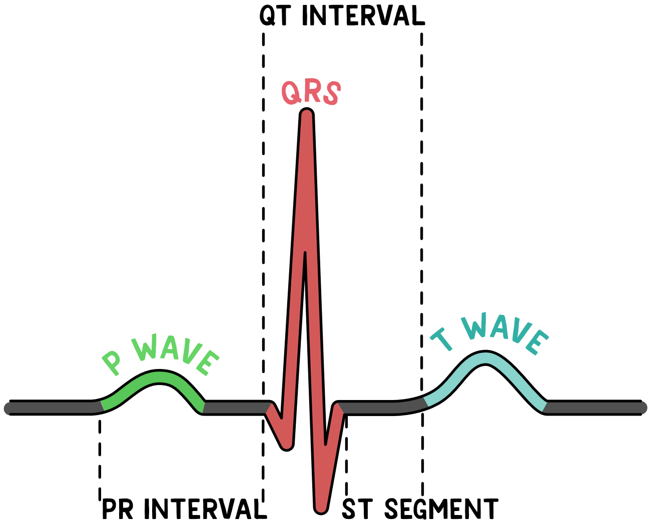
## DIAGNOSTICS

**EKG:** measures electrical activity of heart

**ECHO:** measures ejection fraction & cardiac output + assesses valve function

**CARDIAC CATH:** measures pressure & blood flow in the heart

# EKG BASICS



## P WAVE

Atrial **depolarization** (both atria contract)

## QRS COMPLEX

Ventricular **depolarization** & atrial **repolarization**
(both ventricles **contract**, both atria **relax**)

## T WAVE

Ventricular **repolarization** (both ventricles **relax**)

**NORMAL VALUES**

**PR INTERVAL:** 0.12 - 0.20
**QRS COMPLEX:** 0.06 - 0.12
**QT INTERVAL:** 0.35 - 0.45

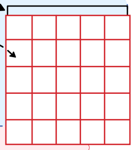
**REPOLARIZATION= RELAX**
**filling** with blood

**DEPOLARIZATION= CONTRACT**
**pumping** blood

## INTERPRETING AN EKG

**KEY**

**1 BIG BOX**= 0.2 secs
**1 SMALL BOX**= 0.04 secs
**1 BIG BOX= 5 SMALL BOXES**

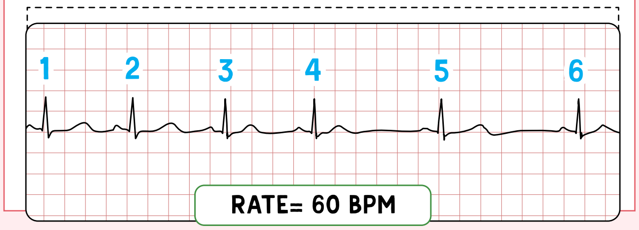


### 1 IDENTIFY THE RATE

**6 SECOND METHOD** **BEST FOR IRREGULAR RHYTHMS**

Count # of R's in 6 second strip & multiply by 10

There are **30 BIG BOXES** in a 6 second strip

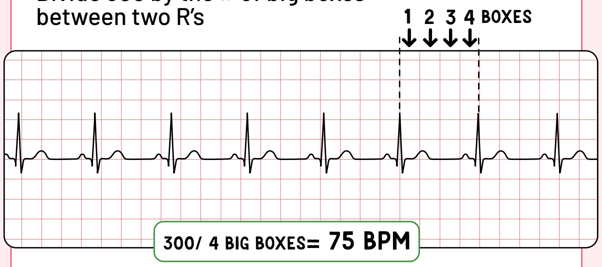


**RATE= 60 BPM**

**BOX METHODS** **BEST FOR REGULAR RHYTHMS**

**BIG BOX METHOD**

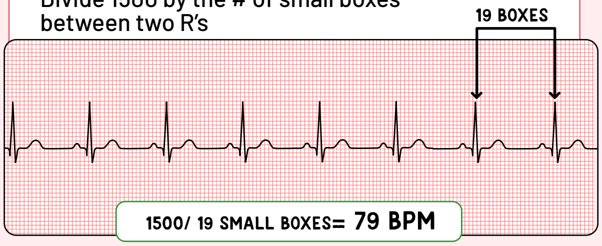
Divide 300 by the # of big boxes between two R's



**300/ 4 BIG BOXES= 75 BPM**

**SMALL BOX METHOD**

Divide 1500 by the # of small boxes between two R's



**1500/ 19 SMALL BOXES= 79 BPM**

### 2 IDENTIFY THE RHYTHM

Are the R-R intervals consistent?

(Check by assessing if the # of boxes between each R are the same)

**SAME # OF BOXES= REGULAR**

**BOX # VARIES= IRREGULAR**

### 3 IDENTIFY THE P WAVE

① Are the P waves present & upright?
② Is there a P wave for every QRS complex?

### 4 MEASURE PR INTERVAL

**NORMAL: 0.12–0.20**

>0.20 may indicate heart block

### 5 MEASURE QRS COMPLEX

**NORMAL: 0.06–0.12**

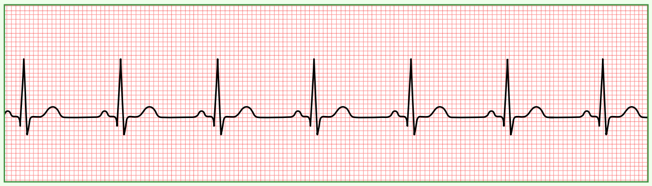
**WIDE QRS (>0.12)** usually seen in:
- ▸Electrolyte imbalances
- ▸PVC's
- ▸Drug toxicity

### 6 IDENTIFY YOUR FINDINGS!

# CARDIAC RHYTHMS

## NORMAL SINUS RHYTHM

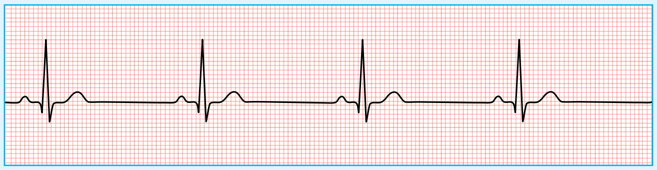
The rhythm of a healthy heart



| | |
|---|---|
| **RATE:** | 60-100 bpm |
| **RHYTHM:** | Regular |
| **P-WAVE:** | Upright & before every QRS |
| **PR INTERVAL:** | Normal |
| **QRS:** | Normal |

## SINUS BRADYCARDIA

Slower than normal heart rate



| | |
|---|---|
| **RATE:** | <60 bpm |
| **RHYTHM:** | Regular |
| **P-WAVE:** | Upright & before every QRS |
| **PR INTERVAL:** | Normal |
| **QRS:** | Normal |

### CAUSES:

- →Vagal stimulation
- →Athletes
- →Medications
  (CCB, Digoxin, beta blockers)

**CONSIDERED NORMAL**
Athletes have a lower resting heart rate due to the heart muscle being stronger & pumping more efficiently

### SYMPTOMS:

- →Syncope
- →Confusion
- →Fatigue

May be completely **ASYMPTOMATIC**

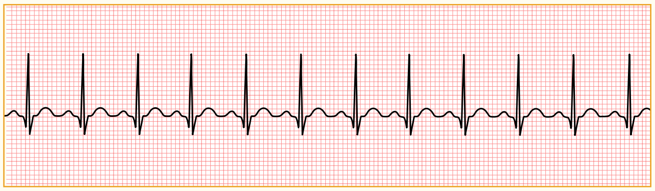
### TREATMENT:

**If symptomatic:**
- →Atropine
- →Transcutaneous pacing

★ If patient is **ASYMPTOMATIC** treatment may not be required

## SINUS TACHYCARDIA

Faster than normal heart rate



| | |
|---|---|
| **RATE:** | >100 bpm |
| **RHYTHM:** | Regular |
| **P-WAVE:** | Upright & before every QRS |
| **PR INTERVAL:** | Normal |
| **QRS:** | Normal |

### CAUSES:

- →Emotional distress
- →Exercise
- →Fever
- →Severe bleeding/ shock
- →Hyperthyroidism
- →Stimulants
  (Anticholinergics, cocaine, caffeine)

### SYMPTOMS:

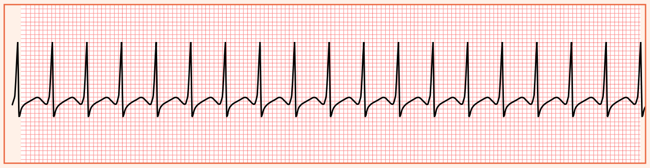
- →Palpitations
- →Shortness of breath
- →Dizziness
- →Headache

### TREATMENT:

**Find & treat underlying cause!**
- →Beta blockers or CCB (if symptomatic)
- →NSAIDs (for fever)
- →Fluid resuscitation (for hypovolemic shock)

## SUPRAVENTRICULAR TACHYCARDIA

Sudden rapid heart rate that originates in the atria



| | |
|---|---|
| **RATE:** | 151-200 bpm |
| **RHYTHM:** | Regular |
| **P-WAVE:** | Undetectable (hidden in t waves) |
| **PR INTERVAL:** | Normal |
| **QRS:** | Narrow |

### CAUSES:

- →Emotional Stress
- →Stimulants

Often triggered by **PREMATURE BEATS**

### SYMPTOMS:

- →Palpitations
- →Shortness of breath
- →Chest pain
- →Syncope

### TREATMENT:

- →Vagal maneuver
- →IV Adenosine

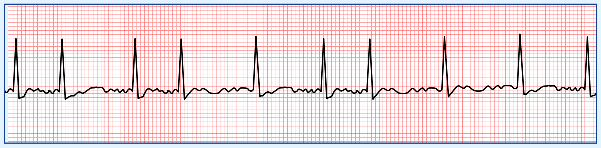
**2 DOSES MAX**
Dosing starts by giving **6mg** and then **12mg** if unsuccessful
**Given FAST with flush immediately after**

# CARDIAC RHYTHMS

## ATRIAL FIBRILLATION & ATRIAL FLUTTER

### ATRIAL FIBRILLATION

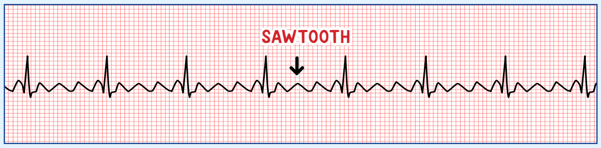
Abnormal electrical in the atria cause "quivering" or "fibbing"



| | |
|---|---|
| **RATE:** | Controlled: <100 Uncontrolled: >100 |
| **RHYTHM:** | Irregularly irregular |
| **P-WAVE:** | Unidentifiable |
| **PR INTERVAL:** | Unmeasurable |
| **QRS:** | Narrow |

### ATRIAL FLUTTER

Similar to afib but with "flutter waves" & atrial rate is regular **most** of the time



| | |
|---|---|
| **RATE:** | Controlled: <100 Uncontrolled: >100 |
| **RHYTHM:** | Regular or irregular |
| **P-WAVE:** | Sawtooth flutter waves |
| **PR INTERVAL:** | Unmeasurable |
| **QRS:** | Regular |

**MAIN DIFFERENCE:**

A-fib's rhythm is erratic & chaotic while a-flutter is organized (mostly) but atrial rate is still fast

### CAUSES:

- Coronary artery disease
- Heart Failure
- COPD
- Hypertension
- Hyperthyroidism

### SYMPTOMS

- Palpitations
- Shortness of breath
- Dizziness
- Chest pain
- Anxiety

May be completely **ASYMPTOMATIC**

### TREATMENT

- Oxygen
- Cardioversion

**SYNCED** shock to attempt to restore to normal rhythm

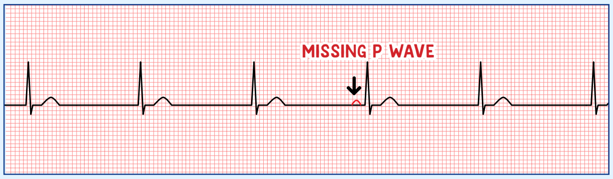
**MEDICATIONS**

- Beta blockers (Metoprolol)
- Calcium channel blockers (Cardizem)
- Antiarrhythmics (Amiodarone, Digoxin)
- Blood thinners

Increased risk of **BLOOD CLOTS**

## JUNCTIONAL RHYTHMS

SA node fails to initiate impulse, so heart rate originates from AV node or His Bundle



| | |
|---|---|
| **RATE:** | Brady: <40 Regular: 40-60 Accelerated: 60-100 |
| **RHYTHM:** | Regular |
| **P-WAVE:** | Inverted or absent<br>**MAIN SIGN USED FOR IDENTIFYING** |
| **PR INTERVAL:** | Unmeasurable |
| **QRS:** | Narrow |

### CAUSES:

- Digoxin toxicity **MOST COMMON**
- Sinus node dysfunction
- Carditis
- Cardiac surgery
- Myocardial infarction

### SYMPTOMS:

- Weakness
- Fatigue
- Chest pain
- Anxiety
- Dizziness

### TREATMENT:

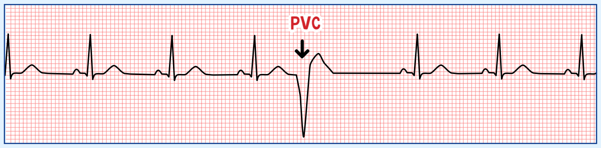
**Find & treat underlying cause!**

- Usually no treatment necessary
- Atropine if rate becomes too slow

## PVC'S (Premature Ventricular Contractions) & PAC'S (Premature Atrial Contractions)

### PVC'S (Premature Ventricular Contractions)

Extra heartbeats that originate from the **ventricles**

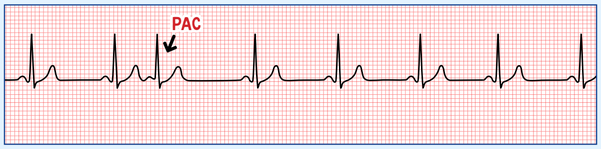


**CHARACTERISTICS:**

- Big, wide, & UGLY
- No p wave before

### PAC'S (Premature Atrial Contractions)

Extra heartbeats that originate from the **atria**



**CHARACTERISTICS:**

- Small & narrow
- Compensatory pause after

### CAUSES:

- Electrolyte imbalance
- Stimulants or stress
- Myocardial infarction
- Heart failure
- Cardiomyopathy

### SYMPTOMS

- May be asymptomatic
- May feel like heart "skipped a beat"

**NOTIFY MD IMMEDIATELY** if frequency increases or chest pain is present

### TREATMENT

**Find & treat underlying cause!**

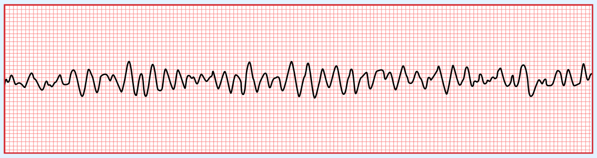
**IF SYMPTOMATIC**

- Correct electrolyte imbalances
- Avoid stimulants
- Assess for pain

# CARDIAC RHYTHMS

## VENTRICULAR FIBRILLATION

Ventricles contract in a very rapid and uncoordinated manner



| | |
|---|---|
| **RATE:** | Rapid & disorganized |
| **RHYTHM:** | Irregular |
| **P-WAVE:** | Not visible |
| **PR INTERVAL:** | Unmeasurable |
| **QRS:** | Unmeasureable |

### CAUSES:

- → Myocardial infarction
- → Electrolyte imbalance
- → Drug toxicity/ overdose
- → Electrical shock
- → Hypothermia
- → Untreated Vtach

### SYMPTOMS:

**MEDICAL EMERGENCY** ⚠

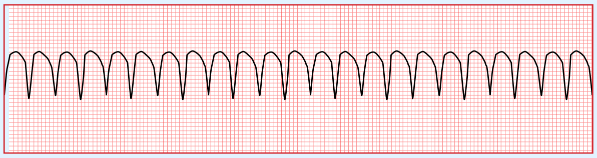
- → Loss of consciousness
- → Most likely no pulse or blood pressure
- → Agonal breathing

### TREATMENT:

- → CPR and defibrillator
- → Follow ACLS protocol (See ACLS & BLS protocol sheet)

## VENTRICULAR TACHYCARDIA

Abnormal electrical impulse causing ventricles to contract at very fast rate



| | |
|---|---|
| **RATE:** | 100-250 bpm |
| **RHYTHM:** | Regular |
| **P-WAVE:** | Not visible |
| **PR INTERVAL:** | Unmeasurable |
| **QRS:** | Wide |

### CAUSES:

- →Myocardial infarction
- →CAD
- →Heart Failure
- →Electrolyte imbalance
- →Digoxin toxicity
- →Stimulants

### SYMPTOMS:

**MEDICAL EMERGENCY** ⚠

- →Palpitations and SOB
- →Chest pain
- →Loss of conciousness

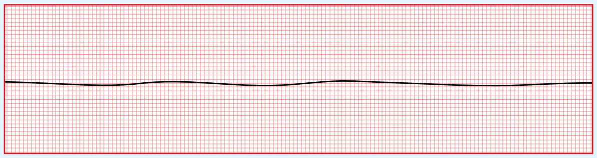
**MAY BE ASYMPTOMATIC** but will **become** symptomatic if sustained

### TREATMENT:

| PULSELESS | STABLE WITH PULSE |
|---|---|
| →CPR and defibrillator | →IV Amiodarone |
| →Follow ACLS protocol | →Synchronized cardioversion |

## ASYSTOLE/ FLATLINE

Heart stops beating entirely



**RATE:**
**RHYTHM:**
**P-WAVE:**
**PR INTERVAL:**
**QRS:**

**NONE**

There is NO electrical activity present!

### CAUSES:

- →Myocardial infarction
- →Electrolyte imbalance
- →Drug toxicity/ overdose
- →Electrical shock
- →Hypothermia
- →Untreated Vtach

### SYMPTOMS:

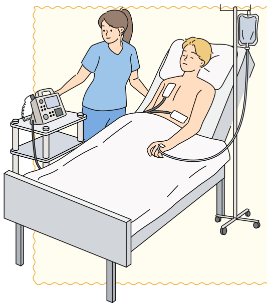
**MEDICAL EMERGENCY** ⚠

- →Loss of consciousness
- →Agonal breathing or apnea
- →No pulse

### TREATMENT:

**NOT A SHOCKABLE RHYTHM**

- →CPR and epinephrine
- →Follow ACLS protocol (See ACLS & BLS protocol sheet)



## CARDIOVERSION

Planned & **synced** shock delivered on **R wave**

**USED FOR**

- SVT
- Afib
- Stable vtach with pulse

**WHY IS IT SYNCED?**

If shock is delivered on T wave can cause **R on T Phenomenon causing vfib** & lead to **CARDIAC ARREST!**

**JOULES USED:** **50-200**

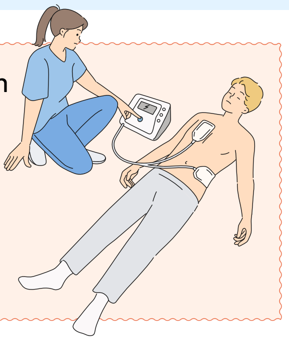
Need consent prior to procedure

## DEFIBRILLATION

**Unsynchronized** shock given in emergent situation

**USED FOR**

- Pulseless Vtach
- Vfib



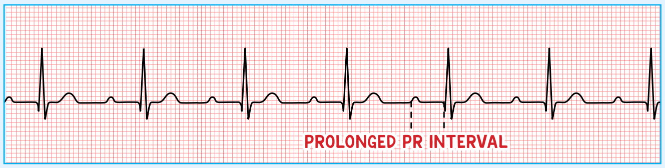
**JOULES USED:** **200-360**

# CARDIAC RHYTHMS
## HEART BLOCKS

## 1ST DEGREE HEART BLOCK

> "IF THE R IS FAR FROM P, THEN YOU HAVE A FIRST DEGREE"

Abnormally slow conduction through the AV node



| | |
|---|---|
| **RATE:** | Normal but can be slower |
| **RHYTHM:** | Regular |
| **P-WAVE:** | Upright & before every QRS |
| **PR INTERVAL:** | Prolonged (>0.20) |
| **QRS:** | Normal |

**CAUSES:**

MAY BE NORMAL FOR SOME PATIENTS!

- →Old age
- →CAD
- →Electrolyte imbalance
- →Medications that slow AV conduction (Beta blockers & calcium channel blockers)

**SYMPTOMS:**

- →Usually **asymptomatic**

**TREATMENT:**

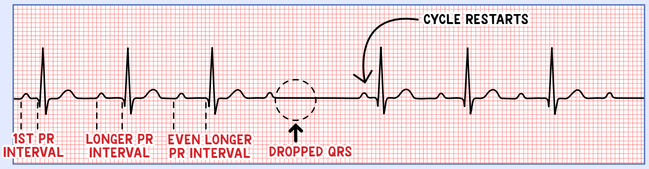
- →Usually requires no treatment
- →Monitor to ensure doesn't progress to more serious HB

## 2ND DEGREE TYPE I

AKA WENCKEBACH

> "LONGER, LONGER, LONGER, DROP– NOW YOU HAVE A WENCKEBACH!"

PR intervals progressively lengthening until QRS complex is dropped completely



| | |
|---|---|
| **RATE:** | Normal |
| **RHYTHM:** | Regularly irregular |
| **P-WAVE:** | Normal |
| **PR INTERVAL:** | Gradually prolonging |
| **QRS:** | Drops in repeating pattern |

**CAUSES:**

- →Rheumatic fever
- →↑ vagal tone
- →Myocardial infarction
- →Medications (Beta blockers & calcium channel blockers)

**SYMPTOMS:**

May be ASYMPTOMATIC

- →Dizziness
- →SOB
- →Weakness
- →AMS
- →Chest pain

**TREATMENT:**

If symptomatic NOTIFY MD

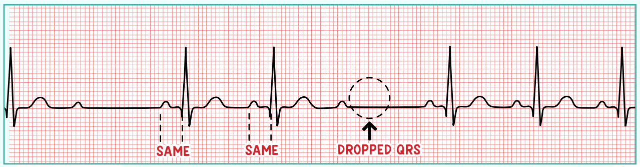
- →Check VS
- →Oxygen
- →EKG
- →Labs

## 2ND DEGREE TYPE II

AKA MOBITZ II

> "IF SOME P'S DON'T GET THROUGH–THEN YOU HAVE A MOBITZ II!"

P waves stay consistent (not progressively lengthening) & QRS is randomly dropped



| | |
|---|---|
| **RATE:** | Normal |
| **RHYTHM:** | Irregular |
| **P-WAVE:** | Normal ("marching" along) |
| **PR INTERVAL:** | Constant (does not get gradually longer) |
| **QRS:** | Randomly drops |

More likely to progress to 3RD DEGREE HEART BLOCK

**CAUSES:**

- →CAD
- →Cardiomyopathy
- →Myocardial infarction
- →Medications (Beta blockers & calcium channel blockers)

**SYMPTOMS:**

- →Dizziness
- →Weakness
- →Syncope

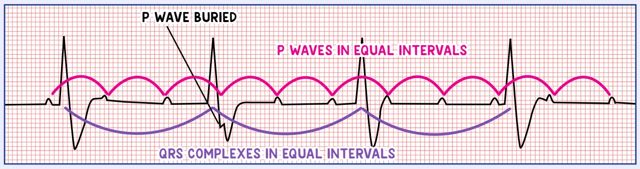
**TREATMENT:**

| ASYMPTOMATIC | SYMPTOMATIC NOTIFY MD |
|---|---|
| →Consult cardio | →Temporary pacing |
| →Review meds | →Permanent pacemaker |

## 3RD DEGREE HEART BLOCK

> "IF P'S AND Q'S DON'T AGREE–THEN YOU HAVE A THIRD DEGREE"

Complete loss of communication between atria & ventricles ("marching to beat of their own drum")



| | |
|---|---|
| **RATE:** | Usually <60 bpm |
| **RHYTHM:** | Regular |
| **P-WAVE:** | Independent from QRS |
| **PR INTERVAL:** | Variable |
| **QRS:** | Independent from P waves |

MEDICAL EMERGENCY
Heart can't pump blood efficiently

**CAUSES:**

- →Myocardial infarction
- →Digoxin toxicity
- →Cardiomyopathy
- →CAD

**SYMPTOMS:**

FROM ↓ CARDIAC OUTPUT

- →Hypotension
- →Chest pain
- →Weakness
- →Pale
- →Clammy
- →Weak pulse

**TREATMENT:** NOTIFY MD

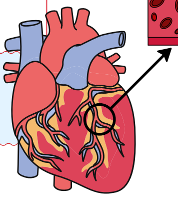
- →Atropine
- →Temporary pacing
- →Permanent pacemaker

# CORONARY ARTERY DISEASE

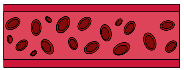
## WHAT IS IT?

Narrowing of the coronary arteries due to atherosclerosis

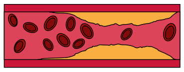
**ATHEROSCLEROSIS**
Plaque build up in arteries from cholesterol deposits



**HEALTHY ARTERY**

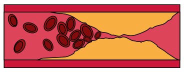


**ATHEROSCLEROSIS**



Plaque builds up leading to narrowed arteries & ↓ blood flow to heart

**MYOCARDIAL INFARCTION**



Plaque can rupture & blood clot forms, completely blocking blood flow

## RISK FACTORS

### MODIFIABLE (CAN BE CHANGED)

- → Smoking & alcohol use
- → Overweight/Obesity
- → Diabetes
- → High cholesterol
- → Stress
- → Sedentary lifestyle

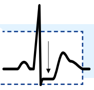
### NON-MODIFIABLE (CANNOT BE CHANGED)

- → Family history
- → Aging
- → Race
- → Gender

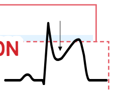
## DIAGNOSTICS

→ **EKG**

**ST DEPRESSION**
Indicates ischemia



**ST ELEVATION**
Indicates injury



→ **STRESS TEST**

→ **CARDIAC CATHETERIZATION** (check arteries)

→ **LABS**

**HDL**
**GOOD** cholesterol
THINK **H** FOR **HAPPY**
WANT HAPPY LEVELS **HIGH**
**>60 MG/DL**

**LDL**
**BAD** cholesterol
THINK **L** FOR **LOUSY**
WANT LOUSY LEVELS **LOW**
**<100 MG/DL**

**OTHER VALUES**
**TRIGLYCERIDES:** <150 mg/dL
**TOTAL CHOL:** <200 mg/dL

## SYMPTOMS

**USUALLY ASYMPTOMATIC!**

- → **Chest pain that goes away with rest**
- → Diaphoresis
- → Shortness of breath
- → Heartburn
- → Nausea/ vomiting
- → Fatigue

## PATIENT EDUCATION

**GOAL:** Patient education to **prevent progression**

- → Smoking cessation
- → Moderate exercise 3-4 times/week
- → Stress management
- → Weight management
- → Monitor heart rate & blood pressure

**DIET**

- → ↓ sodium ↓ saturated fat
- → ↓ alcohol
- → ↑ fiber ↑ fruits & vegetables

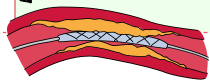
## TREATMENT

### MEDICATIONS

- → **Antiplatelets:** prevent clots from forming
  - ↳ **ASPIRIN**
- → **Antilipidemics:** lower cholesterol levels
  - ↳ **-STATIN**
- → **Nitrates:** for episodes of angina (dilates vessels)
  - ↳ **NITROGLYCERIN**
- → **Antihypertensives**
  - ▸ Beta blockers
  - ▸ Calcium channel blockers
  - ▸ ACE inhibitors
  - ▸ ARBs (if cannot tolerate ACE)

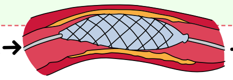
### PROCEDURES

- → **Atherectomy:** removal of plaque from artery
- → **Percutaneous Coronary Intervention (PCI):** unblocks arteries to restore blood flow with balloon and possible stent placement



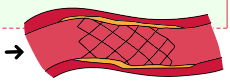
Catheter with balloon inserted into blocked artery

→



Balloon is inflated to compress plaque against walls of artery

→



Catheter is removed & stent is placed to restore bloodflow through artery

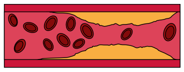
# ANGINA PECTORIS

## WHAT IS IT?

**Chest pain** caused by reduced myocardial blood flow and oxygenation

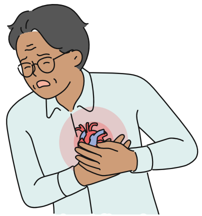
Classic symptom of
**CORONARY ARTERY DISEASE**

**MOST COMMON CAUSE:**
**ATHEROSCLEROSIS**



Plaque builds up leading to narrowed arteries & ↓ blood flow to heart

→



Decreased blood flow & oxygenation to heart results in **CHEST PAIN**

## TYPES OF ANGINA

| STABLE | UNSTABLE | PRINZMETAL/ VARIANT | MICROVASCULAR |
|---|---|---|---|
| ▸ Occurs during **physical exertion**<br>▸ Predictable<br>▸ Relieved with nitrates & rest | ▸ Occurs at rest & **more frequently**<br>▸ Usually not relieved with nitrates & rest<br>**MEDICAL EMERGENCY** ⚠ | ▸ Caused by **coronary vasospasm**<br>▸ Occurs at rest<br>▸ Relieved by nitro & calcium channel blockers | ▸ Spasms of microvascular arteries<br>▸ Pain usually lasts >20 min<br>▸ Can be stable or unstable |

## COMMON TRIGGERS:

- → Physical exertion
  (Shoveling snow, strenuous exercise)
- → Extreme cold (causes vasoconstriction)
- → Extreme heat (can lead to heat exhaustion)
- → Stress (increases myocardial demand)
- → Eating a large meal (increases 02 demand for digestion)
- → Smoking

## SYMPTOMS

### CHEST PAIN

- ⋆ Feeling tight/ dull/ heavy
- ⋆ May radiate to arms, neck, jaw, or back

- → Shortness of breath
- → Weakness & fatigue
- → Dizziness
- → Pallor
- → Diaphoresis

## TREATMENT

### MEDICATIONS

- → **Antiplatelets:** prevent clots from forming
- → **Calcium Channel Blockers:** relax blood vessels
- → **Beta blockers:** reduces 02 demand of heart
- → **Nitrates:** for episodes of angina (dilates vessels)

### ADMINISTERING NITROGLYCERIN

NITROGLYCERIN

- ▸ Administered sublingually every 5 minutes up to 3 doses max
- ▸ Do not take if Sildenafil (Viagra) taken within 24 hrs
- ▸ Call 911 if pain not relieved 5 minutes after 1st dose

### PROCEDURES

- → **Percutaneous Coronary Intervention (PCI):** catheter inserted into arteries with possible stent placement to restore blood flow
- → **Coronary Artery Bypass Surgery (CABG):** vein or artery used to bypass a blocked or narrowed heart artery

## NURSING INTERVENTIONS

- → Vital signs & EKG
- → Administer oxygen
- → Nitroglycerin
- → Semi-fowler's position
- → Maintain calm & quiet environment
- → Encourage rest
- → Monitor pain

### EDUCATION: LIFESTYLE MODIFICATIONS

- → Smoking cessation
- → Moderate exercise 3-4 times/week
- → Stress management
- → Weight management
- → Monitor heart rate & blood pressure

### DIET

- → ↓ sodium ↓ saturated fat
- → ↓ alcohol
- → ↑ fiber ↑ fruits & vegetables

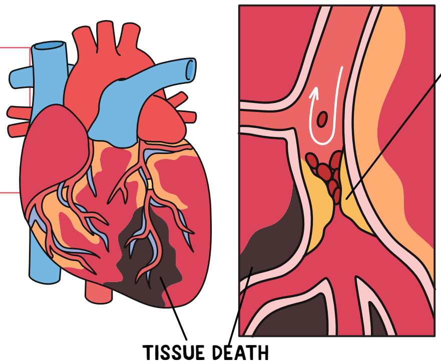
# MYOCARDIAL INFARCTION

## WHAT IS IT?

Myocardial tissue death due to **blockage of blood flow** in one or more coronary arteries

**MEDICAL EMERGENCY** ⚠

**IF NOT TREATED PROMPTLY CAN LEAD TO CARDIAC ARREST**



**BLOCKAGE OF BLOOD FLOW** in coronary artery

↓

heart muscle cells don't get enough 02 rich blood

↓

> 30 minutes of blockage causes **PERMANENT DAMAGE**

## CAUSES

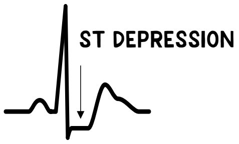
**02 SUPPLY CAN'T MEET 02 DEMAND**

- **ATHEROSCLEROSIS:** plaque ruptures & becomes a blood clot, blocking blood flow
- **ARTERIOSCLEROSIS:** arterial walls thicken and become stiff, blocking blood flow
- **THROMBUS:** blood clot that obstructs vessel
- **CORONARY ARTERY SPASM:** temporary tightening of the vessel blocks blood flow
- **DECREASED OXYGEN SUPPLY:** due to blood loss, anemia, or hypotension

## DIAGNOSTICS

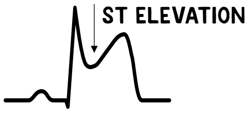
- **PATIENT HISTORY** (check for hx of heart disease)
- **CHECK TROPONIN LEVEL** NORMAL < 0.04
- **ECHOCARDIOGRAM**
- **STRESS TEST**
- **CARDIAC CATH**
- **EKG**

**NSTEMI**



Indicates **LOW** 02

**STEMI**



Indicates **NO** 02

## SYMPTOMS

**SUDDEN, CRUSHING CHEST PAIN**

May radiate to jaw, arm, or shoulder

- Shortness of breath
- Indigestion
- Tachycardia
- Diaphoresis
- Pallor

**WOMEN MAY EXPERIENCE DIFFERENT SYMPTOMS:**

- Extreme fatigue
- Nausea
- Shoulder or neck pain

## NURSING INTERVENTIONS

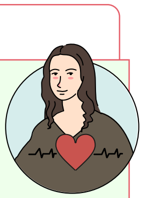
- Strict bedrest
- Supplemental 02 as ordered

**MONITOR**

- Vital signs & EKG
- Lung sounds
- Surgical site
- Signs of bleeding
- Labs (especially cardiac enzymes)
- Chest pain

## TREATMENT

### ① IMMEDIATE



**M ORPHINE:** ↓ pain ↓ 02 demand of heart

**O XYGEN:** ↑ 02 to heart

**N ITRATES:** dilate arteries to ↑ blood flow

**A SPIRIN:** prevents blood from clotting

### ② NEXT (INTERVENTIONS/ PROCEDURES)

**MEDICATION**

- **Thrombolytics (Alteplase):** dissolve clot

**PROCEDURES**

- **PCI:** balloon with possible stent to restore blood flow
- **CABG:** bypass blockage to restore blood flow

### ③ STABILIZATION & PREVENTION

- **Heparin IV:** prevent clot formation
- Beta blockers
- ACE/ ARB
- Calcium channel blockers
- Statin
- Antiplatelets

# CARDIAC TAMPONADE

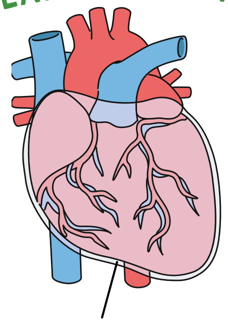
## WHAT IS IT?

Increased pressure on the heart due to accumulation of fluid in the **pericardial space**

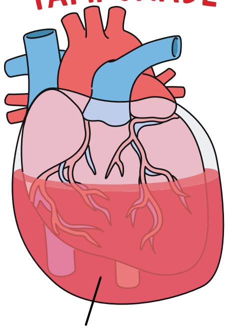
**MEDICAL EMERGENCY** ⚠

Makes it difficult for the heart to pump efficiently causing ↓ **CARDIAC OUTPUT**

HEALTHY HEART



TAMPONADE



## CAUSES

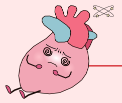
- → Pericarditis (infection of the pericardial sac)
- → Pericardial Effusion (slow fluid build up)
- → Cardiac surgery/ trauma
- → Recent MI (inflammation of cardiac tissue)
- → Cancer

## DIAGNOSTICS

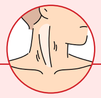
- → **CHEST X-RAY:** will show cardiomegaly
- → **ECHOCARDIOGRAM:** will show fluid around heart
- → **EKG:** may show QRS height variability

## SYMPTOMS

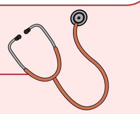
### CLASSIC SIGN: BECK'S TRIAD



**HYPOTENSION**
(from ↓ cardiac output)



**JVD**
(from fluid backing up)



**MUFFLED HEART SOUNDS**
(from fluid around heart)

- → Pulsus Paradoxus – Drop of systolic BP >10 points during inspiration
- → Dypnea
- → Fatigue
- → Chest pain or discomfort
- → Tachycardia & tachypnea

## TREATMENT

★ **PERICARDIOCENTESIS:** drain fluid from around heart

→ **Treat underlying cause**
(such as antibiotics for pericarditis)

**HEMODYNAMIC SUPPORT**

- → Fluids
  (give carefully & monitor for fluid overload)
- → Volume expanders
- → Vasopressors
- → Dobutamine: ↑ contractility

## NURSING INTERVENTIONS

- → Administer oxygen
- → Bed rest
- → Keep HOB elevated
- → Educate patient signs of pericardial effusion

**MONITOR**

- → Continuous vital signs & EKG
- → Lung sounds
- → Labs

## PERICARDIAL EFFUSION

**Slow** fluid build up in pericardial space

If not treated can result in **TAMPONADE**

### SYMPTOMS

- ▶ Chest pain
- ▶ Shortness of breath
- ▶ Difficulty breathing while flat

**GOAL:**
Catch symptoms **early** to prevent progression to tamponade

# CARDIOMYOPATHY

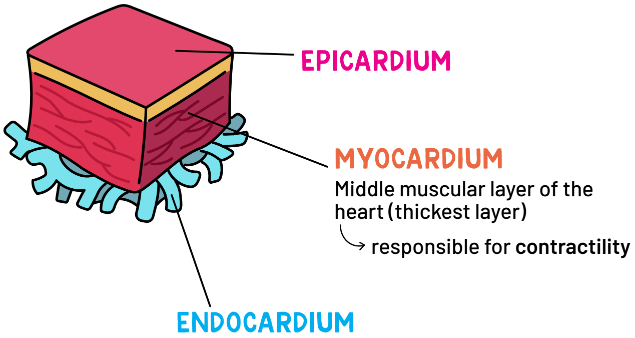
## WHAT IS IT?

Group of diseases that cause dysfunction in the **myocardium** layer of the heart

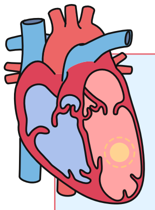
**MYOCARDIUM**

Middle layer of the heart responsible for **contractility**

Affects **pumping mechanism** which leads to ↓ **CARDIAC OUTPUT**


EPICARDIUM
MYOCARDIUM
Middle muscular layer of the heart (thickest layer)
responsible for **contractility**
ENDOCARDIUM

## TYPES OF CARDIOMYOPATHY



MOST COMMON

### DILATED

Chambers **dilate** & muscle walls become **thin & weak**

Leads to **SYSTOLIC PUMP FAILURE**

#### CAUSES

- Coronary artery disease
- Alcoholism
- Toxin exposure
- Certain viral infections (can lead to myocarditis)

#### SYMPTOMS

- Dyspnea
- Orthopnea
- Activity intolerance
- Lower limb edema

+ ALL classic heart failure signs & symptoms

#### DIAGNOSTICS ☢

X-ray will show enlarged heart

#### TREATMENT

- **Diuretics:** reduce fluid overload
- **Digoxin:** improve contractility
- **Beta blockers:** ↓ workload of heart
- **ACE:** ↓ afterload & prevent remodeling
- Calcium channel blockers
- Rest periods & stress reduction

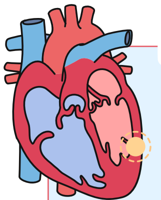
#### HEART FAILURE

The body thinks blood pressure is low due to dilated ventricles

↓

Activates the **RAAS SYSTEM** to hold onto fluid

Will show signs of **RIGHT** & **LEFT** sided heart failure



MOST DEADLY

### HYPERTROPHIC

Heart walls become **thick, stiff & non-compliant**

Can obstruct aortic valve & cause **SUDDEN DEATH**

#### CAUSES

- **Genetics** (usually diagnosed in childhood)

#### SYMPTOMS

**USUALLY ASYMPTOMATIC!**

- Dyspnea
- Syncope
- Chest pain

#### DIAGNOSTICS ☢

Echo will show **septal wall thickening**

#### TREATMENT

- **Myectomy:** remove extra tissue

**MEDICATIONS**

- **Beta blockers:** ↓ HR to ↑ diastolic filling time
- **Calcium channel blockers**

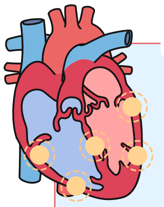
**NEVER GIVE THE 3 D'S**

- ✗ **D**igoxin
- ✗ **D**ilators (nitro)
- ✗ **D**iuretics

Will **WORSEN** obstruction & symptoms

**AVOID STRENUOUS ACTIVITY**

- Intense exercise
- Sudden position changes
- Bearing down (valsalva maneuver)



### RESTRICTIVE

Heart muscle becomes **stiff & hard** like a rock

Stiff ventricles cause **REFILLING ISSUES**

#### CAUSES

- Genetics (amyloidosis, sarcoidosis)
- Radiation exposure

#### SYMPTOMS

Similar to **DILATED CARDIOMYOPATHY**

- Dyspnea
- Orthopnea
- Activity intolerance
- Lower limb edema

#### DIAGNOSTICS ☢

Normal echo & x-ray

#### TREATMENT

**TREAT UNDERLYING CAUSE!**

- Heart transplant
- Decrease radiation exposure
- Diuretics: reduce fluid overload

The heart muscle is **too hard & stiff** for other medications to have a positive effect

# INFECTIVE ENDOCARDITIS

## WHAT IS IT?

Inflammation of the **endocardium** layer of the heart

### ENDOCARDIUM

Innermost layer that lines the heart chambers & valves

**CAUSED BY BACTERIA OR FUNGI**

Pathogens enter blood stream through opening & travel to heart

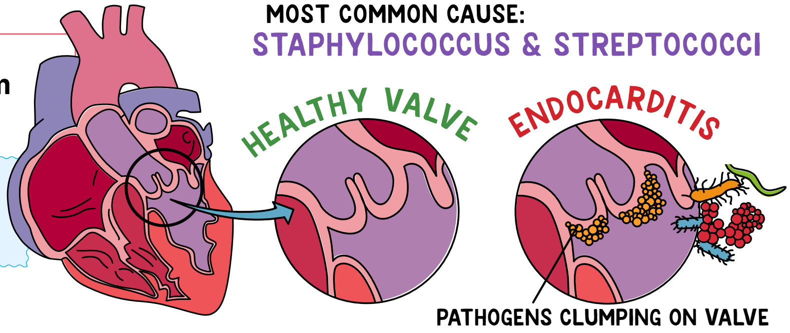
↓

Attach to damaged or weakened heart tissue

↓

Pathogens begin to grow & eventually cause damage

**MOST COMMON CAUSE:**
**STAPHYLOCOCCUS & STREPTOCOCCI**



Bacteria attach to valves causing damage which leads to **impaired pumping action** of the heart causing:

**↓ CARDIAC OUTPUT**

Bacteria form clumps called "vegetations" which platelets build up over time and can form into a **BLOOD CLOT**

## RISK FACTORS

- → Age >60
- → Artificial heart valve or devices
- → Damaged heart valves
- → Poor oral hygiene
- → Congenital heart disease
- → Immunosuppressed
- → IV drug use
- → Untreated strep throat (leads to rheumatic fever)

## DIAGNOSTICS

- → **BLOOD CULTURES:** assess for infective agent
- ★ → **TRANSESOPHOGEAL ECHO:** assess for vegetation
- → **CBC:** will have ↑ WBC

## SYMPTOMS

### CLASSIC SIGNS:

- ★ **Osler's nodes** (painful lesions on hands)
- ★ **Janesway lesions** (nontender lesions on palms & feet)
- ★ **Splinter hemorrhages** (clots stuck under nails)
- ★ **Roth spots** (tiny hemorrhages in eye)

- → Fever & chills
- → New/ changed heart murmur
- → Crackles & dyspnea
- → Chest pain on inspiration
- → Splenomegaly
- → Edema and/ or ascites
- → Petechiae

## TREATMENT

**SURGERY**

Remove dead & infected tissue

**ANTIBIOTIC THERAPY**

Will require IV antibiotics up to 4 weeks

**WILL GO HOME WITH PICC LINE**

### EDUCATION

- ★ Monitor for signs of infection
- ★ Always use aseptic technique
- ★ Do NOT stop antibiotics (must fully finish ABX course)

### DENTAL CARE

Educate patient about importance of **good oral hygiene** & to notify dentist before any **invasive procedures**

## NURSING INTERVENTIONS

- → Supplemental oxygen
- → DVT prevention
- → Antipyretics for fever

**MONITOR**

- → Vital signs (especially temperature)
- → Heart rhythm
- → Signs of heart failure
- → Embolic episodes

**WATCH FOR SIGNS OF:**

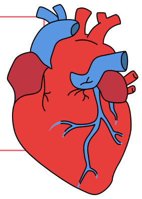
- ▸ Pulmonary embolism
- ▸ Stroke
- ▸ Flank pain (renal)
- ▸ Abdominal pain (spleen)

# HEART FAILURE

## WHAT IS IT?

Dysfunction of the heart affecting it's ability to **fill or pump blood effectively**

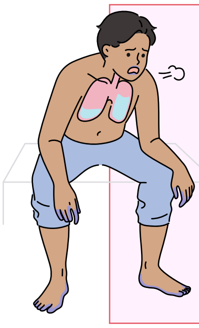
Leads to ↓ **CARDIAC OUTPUT**



## CAUSES: Anything that **damages** or **weakens** the heart

- Cardiomyopathy
- Coronary artery disease
- Myocardial infarction
- Hypertension
- Endocarditis
- Congenital heart disease
- Arrhythmias
- Alcohol or drug use

## LEFT-SIDED



Left side of heart can't pump blood out of heart so blood backs up into the **LUNGS**

→ Dyspnea & SOB
→ Crackles
→ Fatigue
→ Pink, frothy sputum

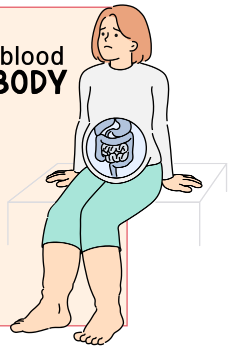
**REMEMBER L FOR LUNGS**

## RIGHT-SIDED

Right side of heart can't pump recieved blood to the lungs so blood backs up into the **BODY**

→ Peripheral edema
→ Ascites
→ JVD
→ Hepatomegaly

**REMEMBER R FOR REST OF BODY**



## DIAGNOSTICS

★ → **BNP BLOOD TEST:** biomarker released by ventricles from excessive pressure & when they become stretched

<100: Normal
300+: Mild heart failure
600+: Moderate heart failure
900+: Severe heart failure

→ **STRESS TEST**

→ **CHEST X-RAY**
(may show infiltrates & cardiomegaly)

→ **CARDIAC CATH**

→ **ECHOCARDIOGRAM**
Measures ejection fraction

### EJECTION FRACTION

Amount of blood being ejected from left ventricle in one pump

**55-70% NORMAL**
**<40% BAD**

## NURSING INTERVENTIONS

→ Supplemental O2
→ High fowler's position
→ Keep legs elevated
→ Fall risk precautions
(due to orthostatic hypotension & fluid status)

### MONITOR

→ Daily weights
→ Strict I &O
→ VS & heart rhythm
→ Lung sounds

### DIET

→ ↓ Sodium (<2g/ day)
→ ↓ Fat
→ Fluid restriction

**AVOID**

✗ OTC drugs (contain sodium)
✗ Fried & processed foods
✗ Canned vegetables & beans

## HEART FAILURE MEDS

### ① ACE INHIBITORS/ ARB

Vasodilate to lower blood pressure (only affect BP, **not HR**)

**ACE INHIBITOR** **-PRIL** **Ex:** Lisinopril
**SIDE EFFECTS:** Dry, nagging cough

**ARB** (Angiotensin II Receptor Blocker) **-SARTAN** **Ex:** Losartan
**SIDE EFFECTS:** Increases potassium levels ⚠

**ARB only used if can't tolerate ACE INHIBITOR**

### ② BETA BLOCKER

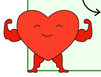
Decreases workload of heart

**-LOL** **Ex:** Metoprolol
**ALWAYS CHECK BP & HR PRIOR TO GIVING**

**SIDE EFFECTS**
- Masks hypoglycemia
- Bronchospasm
- Bradycardia

### ③ DIGOXIN

Positive inotropic that increases contractility



**MAKES HEART PUMP STRONG & SLOW**
Check **apical pulse** before administering

**Monitor for DIGOXIN TOXICITY**
Hypokalemia increases risk so want to **MONITOR K+ LEVELS**

### ④ CALCIUM CHANNEL BLOCKERS

Relaxes vessels to lower blood pressure

**EXAMPLES:**
- Cardizem
- Nifedipine
- Verapamil

**DO NOT GIVE IF:**
- HR <60
- SBP <100 or large drop in BP

### ⑤ VASODILATORS

Dilates vessels to decrease preload & afterload

**EXAMPLES:**
- Nitroglycerin
- Hydralazine
- Isosorbide

**DO NOT GIVE IF:**
- Sildenafil taken within 24 hours
- SBP <100

### ⑥ DIURETICS

Drains excess fluid from body

Monitor K+ levels
**NORMAL: 3.5-5**

**POTASSIUM WASTING** **-IDE** **Ex:** Furosemide & Torsemide
Used in **worsening** or **acute** heart failure

**POTASSIUM SPARING** → **Spironolactone**

Always check BP before giving diuretics!

# HYPERTENSION

## WHAT IS IT?

Condition where the pressure in the blood vessels is consistently higher than normal

**HYPER** → High

**TENSION** → Pressure

**MARKED BY >2 EVENTS OF BP >130/80**

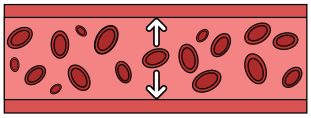
## DUE TO:

**↑ PERIPHERAL RESISTENCE** AND/OR **↑ CARDIAC OUTPUT**

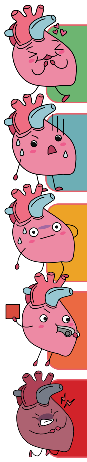
Vaso**constriction**= ↑ resistance

Vaso**dilation**= ↓ resistance

↑ blood volume output = ↑ blood pressure

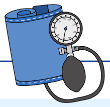


120 / 80 (SYSTOLIC → 120; DIASTOLIC → 80)



| STAGE | SYSTOLIC | | DIASTOLIC |
|---|---|---|---|
| NORMAL | <120 | AND | <80 |
| ELEVATED | 120–129 | AND | <80 |
| STAGE 1 | 130–139 | OR | 80–89 |
| STAGE 2 | 140 & ABOVE | OR | 90 & ABOVE |
| HYPERTENSIVE CRISIS | >180 | AND/OR | >120 |

## FACTORS AFFECTING BP READINGS



### CUFF SIZE

Too **BIG**= false low blood pressure

Too **SMALL**= false high blood pressure

### ARM POSITION

Above heart= false low blood pressure

Dangling= false high blood pressure

### WHITECOAT SYNDROME

Temporarily high BP in doctor's office due to anxiety (allow time to relax & recheck)

## CAUSES/ RISK FACTORS

### PRIMARY

Unknown cause so look at **risk factors**

**NON-MODIFIABLE**

- Age
- Race
- Family History

**HIGHEST RISK**

- African Americans
- Age >65
- + Family history

**MODIFIABLE**

- Obesity
- Alcohol & smoking
- Sedentary
- Stress
- ↑ cholesterol
- ↑ sodium intake

### SECONDARY

**Direct cause** or pre-existing condition

- Diabetes
- Kidney disease
- Pregnancy
- Thyroid imbalance
- Pheochromocytoma
- Cushing's
- Atherosclerosis
- Sleep apnea

## SYMPTOMS

**OFTEN ASYMPTOMATIC!**

Known as the **"SILENT KILLER"**

- Headache
- Blurred vision
- Dizziness
- Chest pain
- Shortness of breath

**UNMANAGED HTN CAN LEAD TO:**

- Stroke
- Myocardial infarction
- Renal failure
- Heart failure

## TREATMENT

### MEDICATIONS

- ACE/ ARBs
- Beta blockers
- Calcium channel blockers
- Diuretics

### LIFESTYLE MODIFICATIONS

- Weight loss
- Stress management
- Moderate exercise 3-4 times/ week
- Smoking cessation

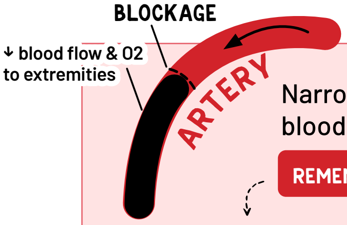
### DIET EDUCATION

**DASH DIET** (**D**ietary **A**pproaches to **S**top **H**ypertension)

- ↑ fruits & vegetables
- low fat dairy
- ↓ sodium & saturated + trans fats
- ↓ alcohol & caffeine intake
- Avoid processed foods (↑ saturated fat)
- Avoid canned foods (contain ↑ sodium)

# PAD vs PVD

(PERIPHERAL ARTERY DISEASE) (PERIPHERAL VASCULAR DISEASE)

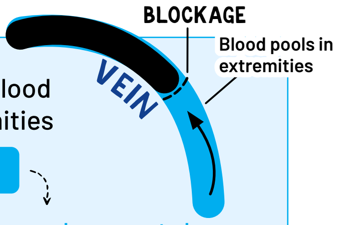


## PAD

Narrowed arteries cause ↓ blood flow to extremities

**REMEMBER A FOR AWAY**

Arteries carry oxygenated blood away from heart to the rest of the body



## PVD

Narrowed veins cause ↓ blood return & pooling in extremities

**REMEMBER V FOR VISIT**

Veins carry deoxygenated blood from the body & tissues to the heart

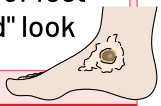
## CAUSES

- Hypertension
- Uncontrolled diabetes
- Smoking
- Hyperlipidemia
- Sedentary lifestyle
- Aging

## PAD

### SYMPTOMS

| | |
|---|---|
| **PULSES** | Decreased or absent |
| **SKIN** | → Dry & thin<br>→ Shiny & missing hair |
| **COLOR & TEMP** | Pale & cool |
| **EDEMA** | None (there's no blood flow!) |
| **PAIN** | Intermittent Claudication – Sharp pain in calf with activity or elevation that goes away with rest |
| **LESIONS** | → Eschar & necrosis<br>→ Ends of toes & tops of feet<br>→ Deep "hole-punched" look |



### DIAGNOSTICS

**ANKLE-BRACHIAL INDEX:** Ankle blood pressure compared to arm blood pressure

Lower ankle pressure indicates ↓ blood flow

### TREATMENT

**HANG ARTERIES**

Dangle legs to promote circulation & help with pain

Elevating legs will make pain **WORSE!**

**MEDICATION**
- → Antiplatelets (Aspirin or Clopidogrel)
- → Statins

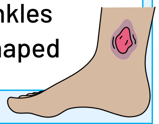
**PROCEDURES**
- → **Artherectomy:** remove plaque build up in arteries
- → **Peripheral Bypass Graft:** blood flow rerouted around occluded artery

**EDUCATION**
- → Stop smoking
- → Avoid crossing legs
- → Avoid cold temps (keep feet warm)

## PVD

### SYMPTOMS

| | |
|---|---|
| **PULSES** | Present<br>(may need doppler due to edema) |
| **SKIN** | Thick & tough |
| **COLOR & TEMP** | Brown/ yellow & warm |
| **EDEMA** | Present (blood is pooling) |
| **PAIN** | Constant, dull & achy |
| **LESIONS** | → Red, granulation & drainage<br>→ Medial lower legs & ankles<br>→ Shallow & irregular shaped |



### DIAGNOSTICS

**VENOUS ULTRASOUND:** Assess for blood flow & any signs of reflux in veins

### TREATMENT

**ELEVATE VEINS**

Elevate legs to help promote blood return to heart

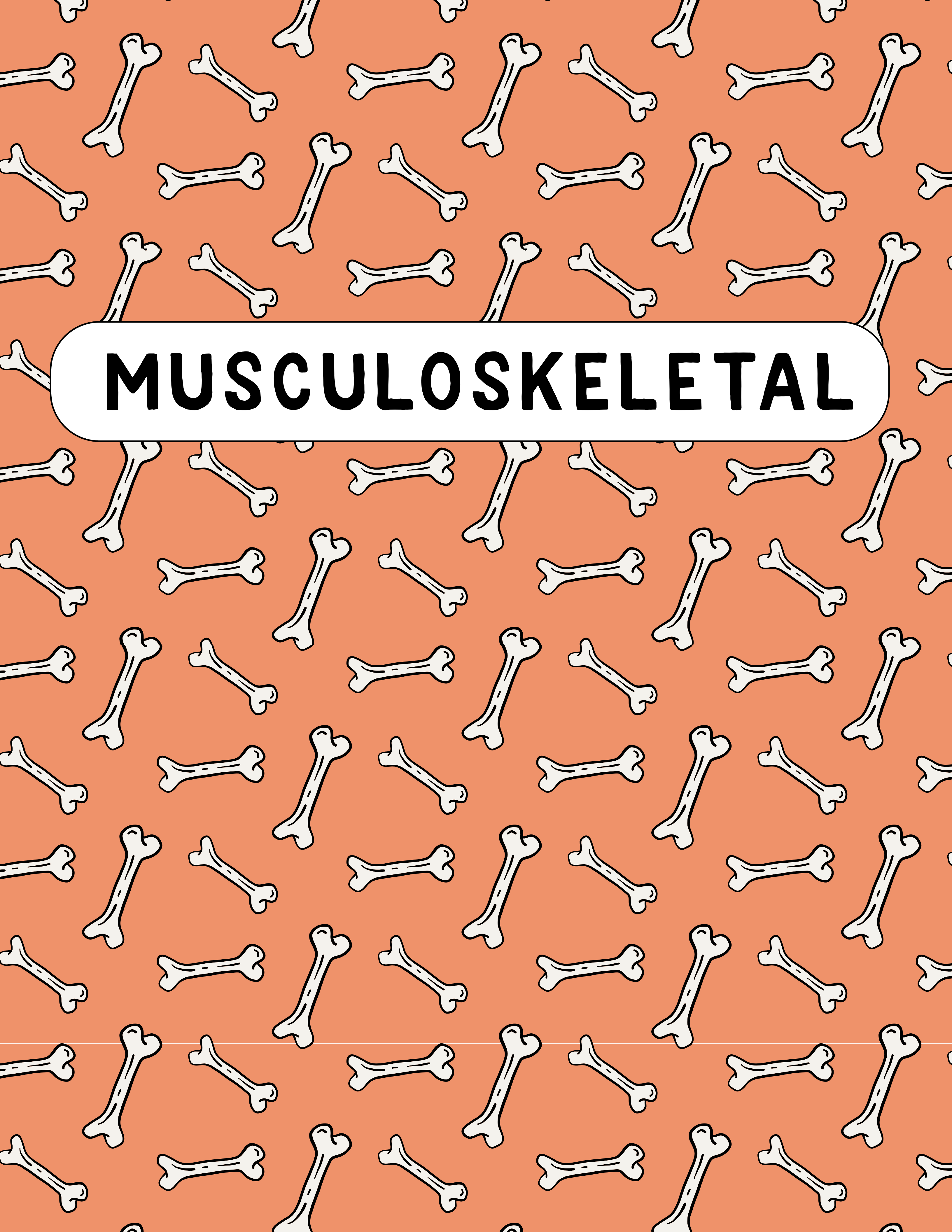
Dangling legs will make edema **WORSE!**

**MEDICATION**
- → Antiplatelets (Aspirin or Clopidogrel)
- → Statins

**PROCEDURES**
- → Angioplasty or stent placement
- → **Peripheral Bypass Graft:** blood flow rerouted around occluded vein

**EDUCATION**
- → Compression stockings
- → Avoid sitting or standing long periods of time
- → Elevate legs when resting

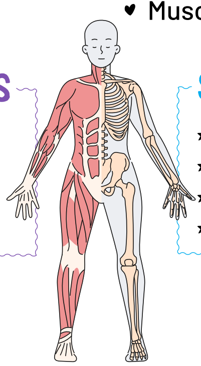
# MUSCULOSKELETAL



# MUSCULOSKELETAL SYSTEM

**THE MUSCULOSKELETAL SYSTEM INCLUDES:**

- Bones
- Joints
- Muscles
- Ligaments
- Tendons
- Connective tissues



## MUSCLE FUNCTIONS

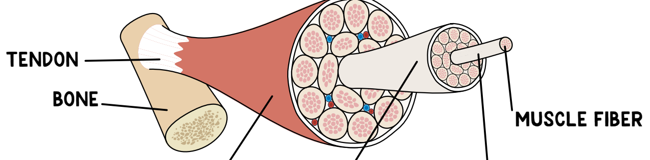
- ★ Produces movement
- ★ Stabilizes joints
- ★ Generates heat
- ★ Maintains posture

## SKELETAL FUNCTIONS

- ★ Provides body structure
- ★ Protects organs
- ★ Storage of minerals & fats
- ★ Blood cell production

→ **ERYTHROPOIETIN** (renal hormone) stimulates bone marrow for RBC production

## MUSCLE LAYERS



**EPIMYSIUM**
**Outermost** layer
→ Covers the entire muscle

**PERIMYSIUM**
**Middle** layer
→ Covers a bundle of muscle fibers

**ENDOMYSIUM**
**Innermost** layer
→ Covers a single muscle fiber

**FASCIA** is connective tissue that covers the **EPIMYSIUM**

## AXIAL SKELETON

Forms the **central** axis of the body

## APPENDICULAR SKELETON

Bones that attach to the axial skeleton

**REMEMBER THE LAW OF ONE'S AND TWO'S**

**WE HAVE ONE:**

- Skull
- Spine
- Rib cage
- Sternum

**WE HAVE TWO:**

- Upper limbs
- Lower limbs
- Shoulder girdles
- Pelvic girdles

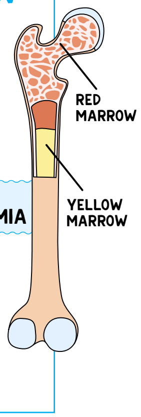
SHOCK ABSORBER

| TENDON | LIGAMENT | CARTILAGE |
|---|---|---|
| connects **muscle to bone** | connects **bone to bone** | covers end of **bone** |
| REMEMBER: **T** FOR **TWO TYPES** | REMEMBER: **L** FOR **LIKE TO LIKE** | REMEMBER: **C** FOR **CAP OF BONE** |

**STRAIN:** injury to **T**endon or muscle

**SPRAIN:** injury to ligament

## TYPES OF BONE MARROW



### RED BONE MARROW

Site of blood cell (RBC, WBC & platelet) development

→ Found in "spongy bone" at end of bones

Renal failure patients can't produce erythropoietin which stimulates **red bone marrow**, causing **ANEMIA**

### YELLOW BONE MARROW

Site of fat storage

→ Found in long bones surrounded by red bone marrow

## TYPES OF JOINTS

**WHAT IS A JOINT?**
Point where two bones make contact

| BALL & SOCKET | SADDLE | HINGE | CONDYLOID | PIVOT | GLIDING |
|---|---|---|---|---|---|
| One bone is hooked into hollow space of another bone | Opposing bones are reciprocally concave & convex | Two bones flex & extend in one plane, like a door hinge | Oval shaped bone that fits into cavity between other bones | Permits movement around a single axis, like a wheel | Sliding movement of bones past each other |
| EXAMPLE: **HIP JOINT** | EXAMPLE: **THUMB** | EXAMPLE: **ELBOW** | EXAMPLE: **METACARPAL JOINTS** | EXAMPLE: **NECK** | EXAMPLE: **WRIST** |
| ✓ FLEXION/EXTENSION<br>✓ ABDUCTION/ ADDUCTION<br>✓ ROTATION | ✓ FLEXION/EXTENSION<br>✓ ABDUCTION/ ADDUCTION<br>✗ ROTATION | ✓ FLEXION/EXTENSION<br>✗ ABDUCTION/ ADDUCTION<br>✗ ROTATION | ✓ FLEXION/EXTENSION<br>✓ ABDUCTION/ ADDUCTION<br>✗ ROTATION | ✗ FLEXION/EXTENSION<br>✗ ABDUCTION/ ADDUCTION<br>✓ ROTATION | ✗ FLEXION/EXTENSION<br>✗ ABDUCTION/ ADDUCTION<br>✗ ROTATION |
| MOST MOBILE | | | | | GLIDING ONLY |

# MUSCULOSKELETAL ASSESSMENT

## IMPORTANCE of a musculoskeletal assessment:

Assesses the function and ability to perform **activities of daily living (ADL'S)**

### ACTIVITIES OF DAILY LIVING

**Fundamental skills required to independently care for oneself**

- Bathing
- Dressing
- Getting out of bed
- Walking
- Eating
- Using the bathroom

## ASK THE PATIENT:

- ⋆ Do you use any assistive devices? (cane, walker, brace, etc.)
- ⋆ Have you had any recent falls?
- ⋆ Do you need assistance performing any daily tasks? (cooking, eating, bathing)

## ① INSPECT

Observe for any abnormalities by inspecting:

- Postural & overall stance
- Gait & balance while walking/ standing
- Curvature of spine
- Pain with **ACTIVE ROM**

### RANGE OF MOTION (ROM)

How far & in what direction you can move a joint

**ACTIVE ROM**
Carried out by **patient**
(involves muscular contraction)

**PASSIVE ROM**
Carried out by **outside force**
(**does not** involve muscular contraction)

## ② PALPATE

Observe for any abnormalities by:

- Palpating muscles & joints for warmth, swelling, or tenderness
- Perform **PASSIVE ROM**
- Assess muscle strength

### STRENGTH SCALE

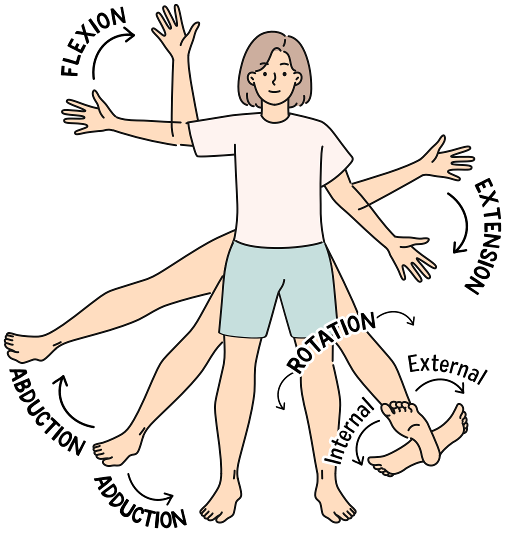
| | |
|---|---|
| 5 | Normal movement against gravity & resistance |
| 4 | Movement against moderate resistance |
| 3 | Movement against gravity but not resistance |
| 2 | Movement only when gravity eliminated |
| 1 | Muscle contracts; no movement (twitch) |
| 0 | No movement |

## FACTORS AFFECTING PHYSICAL MOBILITY

Anything that causes damage to the muscular or skeletal system or the ability to control it

- Aging
- Sedentary lifestyle
- Recent surgery
- Pain
- Obesity or malnutrition
- Fractures/ injury
- Nerve degeneration
  - Diabetes
  - Multiple Sclerosis
  - Stroke
- Bone degeneration (Osteoarthritis)
- Sedative medications
- Muscle atrophy

**Non-mobility related factors** such as orthostatic hypotension or shortness of breath can also affect a patient's ability to safely mobilize



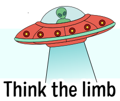
## TYPES OF MOVEMENT

**FLEXION:** bending a joint

**EXTENSION:** straightening a joint

**ADDUCTION:** towards the midline

**ABDUCTION:** away from midline



Think the limb is being **abducted** from the body

**INTERNAL ROTATION:** rotate towards midline

**EXTERNAL ROTATION:** rotate away from midline

**PRONATION:** facing down

**SUPINATION:** facing up

**CIRCUMDUCTION:** rotating in a circle

**PLANTAR FLEXION:** toes pointing away (tip-toes)

**DORSIFLEXION:** toes pulling towards head

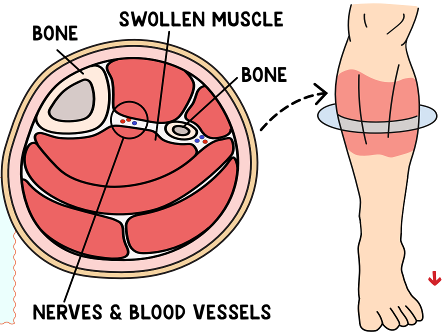
# ACUTE COMPARTMENT SYNDROME

## WHAT IS IT?

Rapid increase in pressure caused by swelling within a muscle compartment

**LEADS TO:**

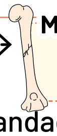
① **PAIN** (from excessive compartment pressure)
② **↓ BLOOD FLOW** (from compressed blood vessels)
③ **NEUROVASC. IMPAIRMENT** (from compressed nerves)



**Swelling or bleeding** in a muscle compartment leads to increased pressure
↓
Blood vessels & nerves **become compressed** from pressure leading to:
↓
**↓ TISSUE PERFUSION**

## CAUSES

- → Fractures
- → Restricting casts or bandages
- → Crush injuries
- → Burns
- → Bleeding disorders
- → IV infiltration



**MOST COMMON CAUSE**
Tibial fractures

## DIAGNOSTICS

★ → **COMPARTMENT PRESSURE TEST:** needle device inserted into muscle to measure pressure

**NORMAL: 0–10 MMHG** | **ELEVATED: >20 MMHG** | **EMERGENT: >30 MMHG**

→ **CREATINE KINASE:** detects muscle destruction

→ **CT SCAN/ MRI**

→ **NEAR-INFRARED SPECTROSCOPY:** assesses blood flow to muscle compartment

## SYMPTOMS

**REMEMBER THE 6 P'S**

**PAIN:** commonly felt with passive stretch **EARLY SIGN**

**PALLOR:** paleness of extremity

**PARESTHESIA:** tingling or burning sensation

**PARALYSIS:** inability to move limb

**POIKILOTHERMIA:** cold to touch

**PULSELESSNESS:** no peripheral pulse **LATE SIGN**

## TREATMENT

- → Opioid analgesics & NSAID's
- → IV Fluids: increase perfusion to limb
- → Elevate extremity at **heart level**
  - **Do not elevate above heart level**; this will decrease perfusion & worsen compartment syndrome!

**PROCEDURES**

- → Fasciotomy: incision into fascia to relieve pressure & restore blood flow
- → Amputation: in severe cases if limb becomes gangrenous (to avoid gangrene from spreading)

## COMPLICATIONS

### RHABDOMYOLYSIS

Myoglobin released due to muscle damage & filtered out through kidneys causing **acute kidney injury**

- ▸ Tea colored urine
- ▸ Muscle pain
- ▸ Muscle weakness

### GANGRENE

Lack of blood flow to tissue or limb causes tissue to break down & die causing **permanent damage**

- ▸ Red/purple/ black skin in affected area
- ▸ Sores or blisters
- ▸ Foul smelling wound

## NURSING INTERVENTIONS

- → Frequent neurovascular checks
- → Administer oxygen as needed
- → Pain management
- → Monitor VS
- → Keep extremity elevated (heart level)
- → Promote calm environment
  (stress causes **vasoconstriction** which worsens perfusion)

**ASSESS:**
▸Pulse
▸Color
▸Cap refill
▸Temperature
▸Sensation
▸Movement

**AVOID**

- ▸ Restrictive clothing
- ▸ Tight casts or bandages
- ▸ Placing limb above or below heart level

**ON AFFECTED LIMB NO:**
⃠ BP measurements
⃠ IV lines
⃠ Blood draws

# DEGENERATIVE DISC DISEASE

## WHAT IS IT?

Group of conditions that cause damage or wearing down of the **intervetebral discs**

### INTERVETEBRAL DISCS

Gel-like substance between each vertebrae that provide cushioning and act as shock absorbers for the spine

If damage or wear gets severe enough can cause

**COMPRESSION OF SPINAL NERVES**

## RISK FACTORS

- Aging (40 and above)
- Female (more common)
- Family history
- Obesity
- Smoking
- Acute injuries
- Working a physically demanding job
- High impact sports

## SYMPTOMS

**DEPEND ON LOCATION & SEVERITY**

- Neck & back pain **MOST COMMON**
- Paresthesia of extremities (numbness & tingling)
- Radiating pain (low back, buttocks, sciatica)
- Bowel and bladder dysfunction
- Muscle weakness
- Unable to bend
- Decreased reflexes

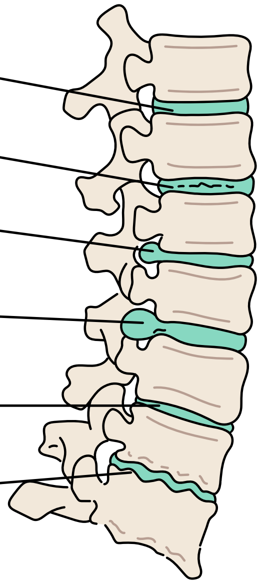
## NURSING INTERVENTIONS

- Frequent neurovascular checks if patient had spinal surgery
- Assess & manage pain
- ROM exercises
- Assess bladder & bowel function

### PATIENT EDUCATION

- Low impact exercise (walking, swimming, yoga)
- Maintain neutral spinal alignment
- Alternate heat & cold therapy

**HEAT** for spasms & **ICE** for inflammation/ swelling



**NORMAL DISC**

**DEGENERATIVE DISC**
Disc begins to become brittle and wear away

**BULGING DISC**
Disc becomes flattened & slightly pushes out

**HERNIATED DISC**
Outer layer of disc cracks & inner disc contents leak out

**THINNING DISC**
Inner contents of disc lose fluid, reducing "sponginess"

**OSTEOPHYTE FORMATION**
Bone spurs develop on vertebrae, compressing disc

## DIAGNOSTICS

- **MRI** **GOLD STANDARD**
- **X-RAY:** will show disc space narrowing
- **ELECTROMYOGRAPHY:** assess for nerve irritation
- **STRAIGHT LEG RAISE TEST:** assess for herniation

① Patient lies on back with legs straight
② Raises one leg at a time between 30-60 degrees

**PAIN= POSITIVE TEST**
May indicate disc herniation

## TREATMENT

- Physical therapy
- Weight loss to reduce pressure on spine

### MEDICATIONS

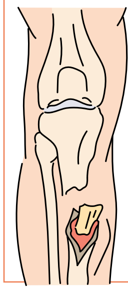
- **Corticosteroid injections:** reduce inflammation
- **NSAIDs:** reduce pain
- **Muscle relaxants:** reduce muscle spasms

### PROCEDURES

- **Laminectomy:** removal of small portion of vertebra (lamina) to relieve pressure
- **Discectomy:** removal of herniated disc to relieve pressure
- **Foraminotomy:** expands opening where nerve roots exit to reduce compression
- **Osteophyte removal:** removal of bone spurs

# FRACTURES

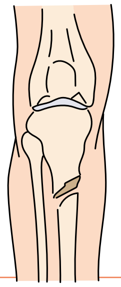
## OPEN vs. CLOSED



### OPEN

Broken bone punctures through skin

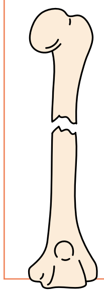
MORE PRONE TO OSTEOMYELTIS



### CLOSED

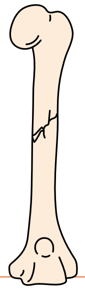
Broken bone but skin remains intact

## COMPLETE vs. INCOMPLETE



### COMPLETE

Bone broken completely into two seperate pieces

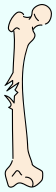


### INCOMPLETE

(PARTIAL)

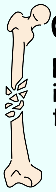
Bones not completely broken into seperate pieces

## TYPES of FRACTURES



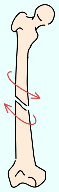
### GREENSTICK

One side of bone is bent & other side is broken



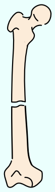
### COMMINUTED

Bone is broken into multiple fragments



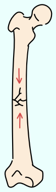
### SPIRAL

Fracture twists around bone shaft



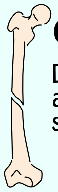
### TRANSVERSE

Fracture is straight across bone shaft



### IMPACTED

Two pieces of bone driving into each other



### OBLIQUE

Diagonal break across bone shaft

## CAUSES

- **TRAUMA**
  - Car accidents
  - Falls
- **WEAKENED BONES**
  - Osteoporosis
  - Cancer
- **SUDDEN TWISTING MOTIONS**
  - Sports injuries

## SYMPTOMS

- Bruising over site
- Pain & reduced movement of site
- Edema/ swelling at site
- Visible deformity
- Crepitus with movement
- Sensory impairment

## TREATMENT

- **REDUCTION:** restores alignment of bone
  - Closed Reduction: non-surgical approach (externally manipulated)
  - Open Reduction: surgically reset bone via incision
- **IMMOBILIZATION:** maintains reduction to allow healing (splint, cast, brace, or sling)
- **FIXATION:** stabilizes fractured bone
  - External Fixation: pins/wires attached to external frame
  - Internal Fixation: surgically implanted pins/screw/rods
- **TRACTION:** application of pulling force to bone using weights or pulley to put tension on displaced bone

## NURSING INTERVENTIONS

- Follow **PRICE**
- Apply sterile dressing to open fractures
- Monitor VS, RR & signs of shock
- Pain management
- Keep NPO in case of surgery
- Log roll if suspect SCI

**P**rotect
**R**est
**I**ce
**C**ompress
**E**levate

## COMPLICATIONS

### FAT EMBOLISM

Clot from bone marrow is released & lodges in blood vessel, blocking circulation

- Mental status changes
- Tachypnea
- Petichiae

Common in **LONG BONE FRACTURES**

### OSTEOMYELITIS

Bacteria enters bone & nearby tissue

- Pain
- Fever
- Swelling at site

### COMPARTMENT SYNDROME

Rapid increase in pressure from bleeding/ swelling cuts off circulation & can cause neurovascular damage

①Pain
②Pallor
③Pulselessness
④Parasethesia
⑤Poikilothermia
⑥Paralysis

**6 P'S**

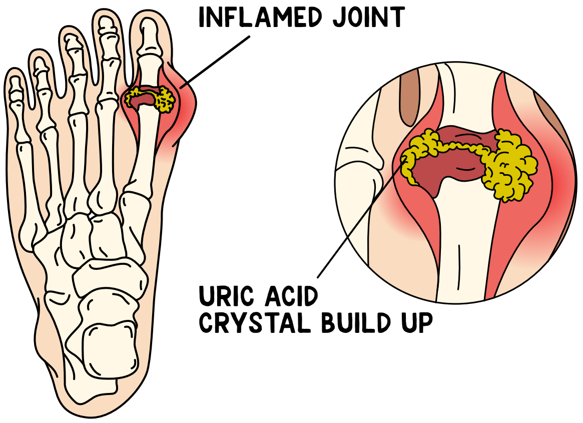
# GOUT

## WHAT IS IT?

A type of arthritis that occurs due to **uric acid** buildup in the blood

Uric acid build up leads to crystal formation in joints, causing **PAIN & SWELLING**

**URIC ACID** is a byproduct created from the breakdown of purine during digestion
(filtered through kidneys & excreted through urine)



## RISK FACTORS

- Excessive intake of purine-rich foods
- Kidney disease (unable to excrete uric acid)
- Dehydration (concentrates uric acid)
- Family history
- Obesity
- Diabetes Mellitus
- Stress
- Medications (Thiazide & loop diuretics, Niacin, Aspirin)

## DIAGNOSTICS

Can only be diagnosed during an **ACTIVE FLARE UP** when uric acid crystals are present

- **BLOOD URIC ACID LEVEL**
  - **NORMAL** (FEMALE): 2.5–6.2 MG/DL
  - **NORMAL** (MALE): 4.5–8 MG/DL
- **SYNOVIAL FLUID ANALYSIS:** will show uric acid crystals (used to confirm diagnosis)
- **XRAY:** will show damage to bone/ cartilage if chronic

## SYMPTOMS

Characterized by **GOUT ATTACKS** (WORSENING OF SYMPTOMS) & **REMISSIONS** (DISAPPEARANCE OF SYMPTOMS)

**SUDDEN SWELLING & PAIN IN JOINT**

MOST COMMON IN **BIG TOE**

- Usually at night & awakens patient from sleep
- Acute pain that gets worse as day progresses
- Can't tolerate any pressure on area

### CHRONIC CASES

After repeated attacks joints become permanently damaged as uric acid crystals form together to form **TOPHI**

White/ yellowish nodules that form under skin & commonly found in fingers, toes, outer ears, & joints

## TREATMENT

### FOR ACUTE ATTACKS

**NO GRAPEFRUIT!** can cause toxicity

- ★ **Colchicine:** decreases uric acid & swelling
- **Corticosteroids:** decrease inflammation
- **NSAIDs:** decrease inflammation & pain

### FOR PREVENTION

- ★ **Allopurinol:** decreases production of uric acid
- **NSAIDs & Colchicine**

**NO ASPIRIN**
Increase uric acid levels

## NURSING INTERVENTIONS

- Encourage fluids (2-3 L/ day)
- Elevate limb to decrease inflammation
- Assess joints for swelling, erythema & pain
- Alternate between heat & cold
- PT & OT

### EDUCATION

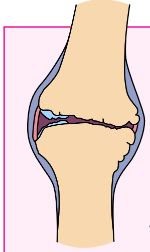
- Weight loss
- Stress management
- Use of mobility aids
- **Diet:** avoid high purine foods

### HIGH PURINE FOODS TO AVOID

- Seafood
- Organ meats
- Red meat
- Alcohol (especially beer)
- High fructose corn syrup (sodas & fruit juice)
- Beans
- Anchovies

# OSTEOARTHRITIS vs. RHEMATOID ARTHRITIS

## OA



Progressive breakdown & loss of cartilage in joints from wear & tear

**DEGENERATIVE DISEASE**

Affects mostly **WEIGHT BEARING** joints

### RISK-FACTORS

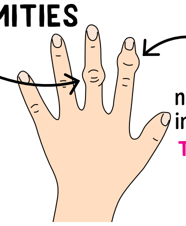
- Old age
- Female
- Obesity
- Repetitive joint stress

### SYMPTOMS

| | |
|---|---|
| **STIFFNESS** | morning stiffness that lasts **less than 30 mins** |
| **JOINTS** | Hard & bony (no inflammation present) |
| **LOCATION** | Asymmetrical & localized |

**NODES & DEFORMITIES**

**BOUCHARD'S**
nodes found on **proximal** interphalangeal joint
THINK B FOR BELOW



**HEBERDEN**
nodes found on **distal** interphalangeal joint
THINK H FOR HIGH

### DIAGNOSTICS

**X-RAY/ MRI:** to assess joints

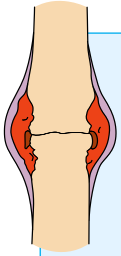
### TREATMENT

**MEDICATION**

- → **NSAID's:** pain relief
- → **Corticosteroid injections:** ↓ inflammation of ligaments & tendons
- → **Glucosamine:** slows degeneration
- → Topical analgesics (capsicum gel)

**OSTEOTOMY:** bone near damaged joint cut & realigned

## RA



Body's immune system attacks the joints, causing inflammation

**AUTOIMMUNE DISEASE**

Affects seen **SYSTEMICALLY**

### RISK-FACTORS

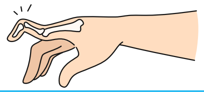
- Age 20-50
- Female
- Family history
- Smoking

### SYMPTOMS

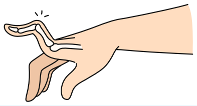
| | |
|---|---|
| **STIFFNESS** | Morning stiffness that lasts greater than 30 mins |
| **JOINTS** | Warm, soft, & swollen |
| **LOCATION** | Symmetrical & systemic |

**NODES & DEFORMITIES**

**SWAN-NECK**
- Proximal hyperextension
- Distal flexion



**BOUTONNIERE**
- Proximal flexion
- Distal hyperextension



**ULNAR DRIFT**
Fingers bend towards pinky finger

### DIAGNOSTICS

- → Positive Rheumatoid Factor test & Antinuclear Antibodies
- → ↑ C Reactive Protein & Sedimentation Rate

### TREATMENT

**MEDICATION**

- → **NSAID's:** pain relief
- → **Corticosteroids:** ↓ inflammation (Given PO or injection)
- → **DMARD's (Disease Modifying Antirheumatic Drugs):** immune suppressants to avoid attacking joints
  - Hydroxychloroquine, Methotrexate, Sulfasalazine

**SYNOVECTOMY:** removal of inflamed tissue around joint

## EDUCATION

- → Plan periods of rest with activity
- → Use of assistive devices
- → Weight management
- → Alternate heat and cold
- → ROM exercises
- → PT & OT
- → Low impact exercise (walking & swimming)
- → Strength training
- → Rest irritated joints

# OSTEOMYELITIS

## WHAT IS IT?

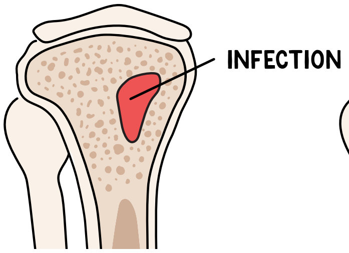
**Infection of the bone** causing inflammation to bone & surrounding structures

Most common cause is
**STAPHYLOCOCCUS AUREUS**

**Can also be caused by:**

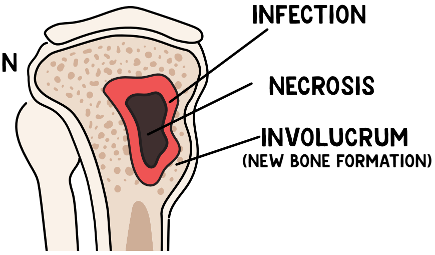
- E. Coli
- Pseudomonas
- Salmonella
- Streptococcus

STARTS AS:
**ACUTE**



New infection that resolves with treatment

CAN BECOME:
**CHRONIC**



Chronic infection leads to **necrosis** & **bone destruction**

## RISK FACTORS

- Trauma/ open wounds
- Recent surgery
- Secondary infection (staph infection)
- Poor circulation
  - Diabetes
  - Peripheral vascular disease
- Immunocompromised
  - HIV
  - Cancer

## DIAGNOSTICS

- **BONE BIOPSY**
- **BLOOD CULTURE:** identify causative agent
- **LABS**
  - ↑ ESR >20 MM/HR = INFLAMMATION
  - ↑ CRP >3 MG/DL = INFLAMMATION
  - ↑WBC >10,000 MM3 = INFECTION

  **INFLAMMATORY MARKERS**
- **XRAY/ CT SCAN/ MRI**

## SYMPTOMS

**ACUTE (< 6 WEEKS)**

- Severe pain
- Fever
- Edema
- Erythema & warm at site
- Elevated WBC's

**PAIN CHARACTERISTICS**

- Localized
- Constant
- Pulsating
- Worsens with movement

**CHRONIC (>6 WEEKS)**

- Pain (not as severe as acute)
- Drainage from site
- Ulceration of skin
- Development of **SEQUESTRA**

Necrotic bone fragment that forms due to lack of blood flow becomes separated from healthy bone

**COMPLICATION: SEPSIS**

Bacteria from bone infection can travel & get into the blood causing **widespread systemic response**

**MONITOR FOR:**

- Altered LOC
- ↓BP ↑HR ↑RR ↑Temp
- Elevated lactic acid & procalcitonin

## TREATMENT

### MEDICATION

PATIENT MIGHT GO HOME WITH PICC LINE

- **IV antibiotics:** 4-6 weeks (sometimes longer)
- **Antipyretics:** for fever
- **NSAIDs:** for pain management

### PROCEDURES

- **Debridement:** wash & remove any damaged or dead tissue
- **Hyperbaric oxygen:** high oxygen concentration to promote perfusion to affected area
- **Sequestrectomy:** removal of necrotic tissue
- **Amputation:** if no success with other treatments & to avoid spread of infection

## NURSING INTERVENTIONS

- Frequent neurovascular checks
- Elevate extremity to promote circulation
- Monitor VS
- Monitor site for signs of infection
- Wound care (use sterile technique)

**ASSESS:**

- Pulse
- Color
- Cap refill
- Temperature
- Sensation
- Movement

# OSTEOPOROSIS

## WHAT IS IT?

Chronic condition where bones gradually lose density or mass, leading to **weak and brittle bones**

**OSTEOPOROSIS IS IRREVERSIBLE**

**OSTEOCLASTS** breakdown bone faster than **OSTEOBLASTS** can rebuild it

↓

Bone density gradually decreases leading to **osteopenia** (low bone density)

↓

Bone density continues to decrease putting patient at high risk of **FRAGILITY FRACTURES**

## RISK FACTORS

- Lifestyle
  - Sedentary
  - Excessive alcohol & tobacco use
  - ↓ calcium intake
- Aging (more common > 65 years)
- History of broken bones
- Small, thin body frame
- Caucasian or Asian race
- Hormonal imbalance (postmenopausal)
- Long term use of certain meds (corticosteroids, PPI's, antiepileptics)

## SYMPTOMS

Usually **ASYMPTOMATIC** until fractures occur

- Back pain
- Loss of height
- Fractures (usually compression/ fragility fractures)
- Kyphosis AKA Dowager's Hump (Outward curvature of spine)

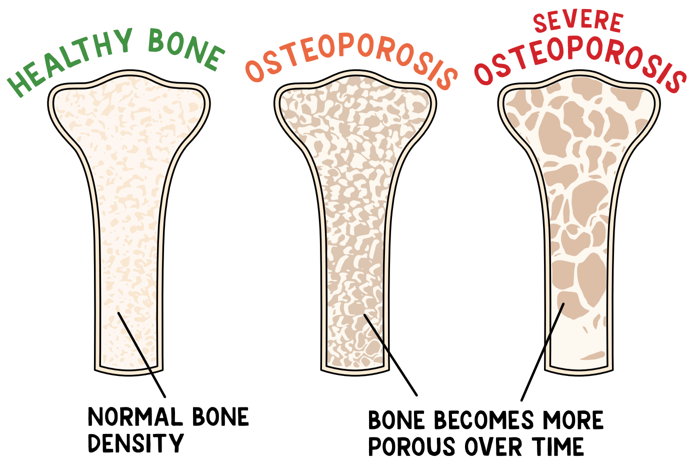
**USUALLY IN:**
- Hips
- Wrists
- Spine

## NURSING INTERVENTIONS

- **FALL PRECAUTIONS: HIGH RISK FOR FRACTURES**
  - Call bell in reach & bed alarm on
  - Assist with ambulation
- Pain management
- ROM exercises

### EDUCATION

- ★↑ protein ↑calcium ↑vitamin D
- ★Smoking cessation
- ★Avoid caffeine & alcohol
- ★Weight bearing exercises
- ★Good body mechanics
- ★Get adequate sunlight (Vit D)



## KEY FACTORS IN BONE HEALTH

**CALCIUM** is one of the main components in bones & plays a vital role in **bone remodeling**

**VITAMIN D:** Promotes absorption of calcium

**PTH:** Stimulates release of calcium when levels are low

**CALCITONIN:** Inhibits osteoclasts (bone breakdown)

**ESTROGEN:** Balances osteoclast & osteoblast activity

BONE FORMATION

## DIAGNOSTICS

- **DEXA SCAN:** measures bone density **GOLD STANDARD**

**0–1: NORMAL** | **–1 TO –2.5: OSTEOPENIA** | **< –2.5: OSTEOPOROSIS**

- **X-RAY/ CT SCAN:** assess for bone loss
- **LABS**
  - Vitamin D
  - Parathyroid hormone
  - Estrogen
  - Calcium

**ALL REGULATE CALCIUM LEVELS**

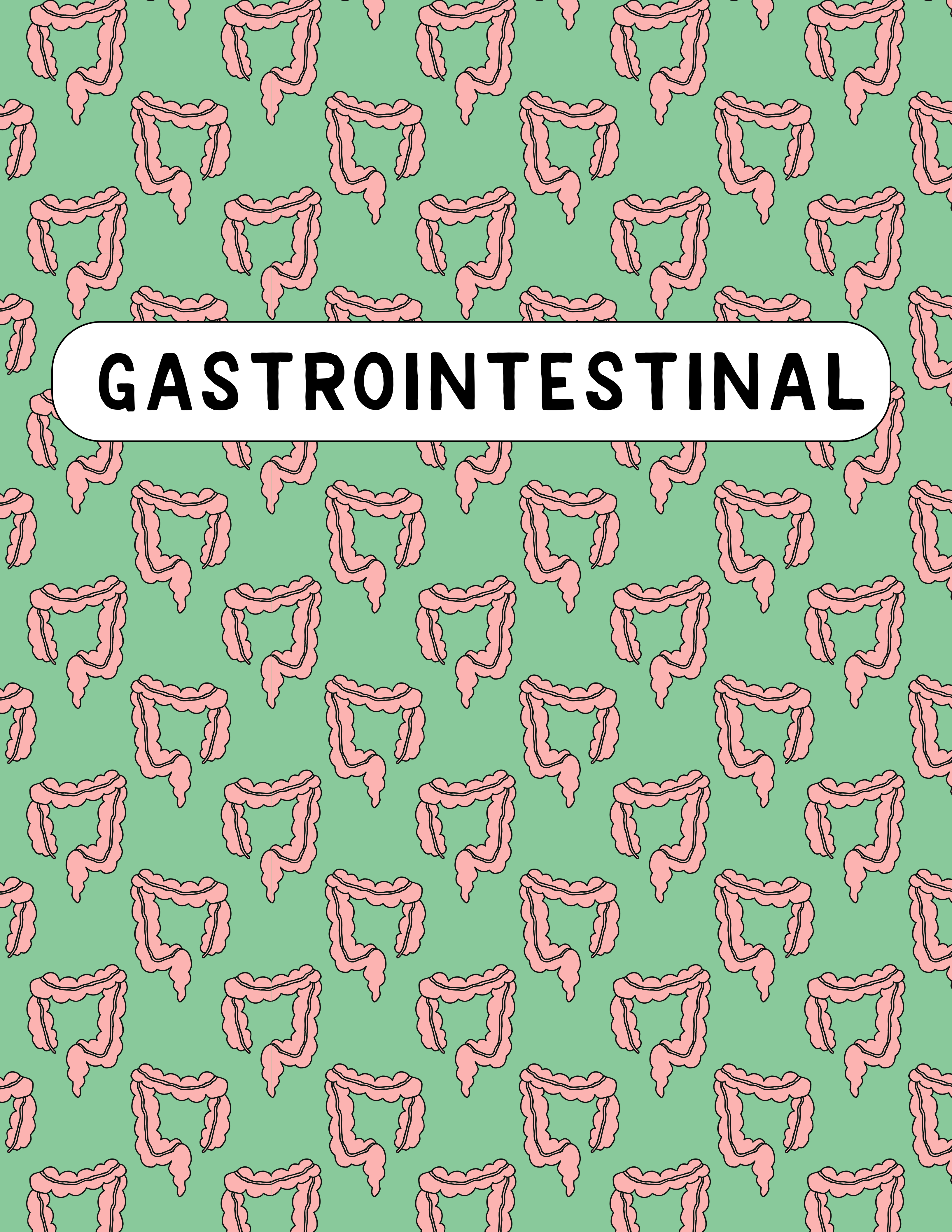
## TREATMENT

### MEDICATION

- **Calcium and Vitamin D supplements** (Vitamin D helps absorb calcium)
- **Bisphosphonates:** inhibit osteoclasts to ↓ bone destruction (Alendronate)
- **Calcitonin:** inhibit osteoclasts to ↓ bone destruction
- **Estrogen:** ↓ bone resorption & promotes bone formation

### PROCEDURES

- **Joint replacement:** replace damaged joint with prosthetic
- **Reduction with fixation:** realign fractures



# GASTROINTESTINAL

# GI SYSTEM OVERVIEW

## MAIN FUNCTIONS

① Digest and absorb ingested nutrients
② Excrete waste products of digestion

## TYPES OF DIGESTION

### MECHANICAL

Physical breakdown of food into smaller pieces

**AKA CHEWING**

### CHEMICAL

Chemical breakdown of food by enzymes found in saliva & pancreas

## UPPER GI TRACT FUNCTIONS

### MOUTH / ORAL CAVITY

Ingests & breaks down food

### PHARYNX & ESOPHAGUS

Carries food from mouth to stomach

### STOMACH

- → Storage site until passed to small intestine
- → Food mixes with gastric acid to form chyme (paste)
- → Absorbs fat-soluble minerals

## LOWER GI TRACT FUNCTIONS

### SMALL INTESTINE

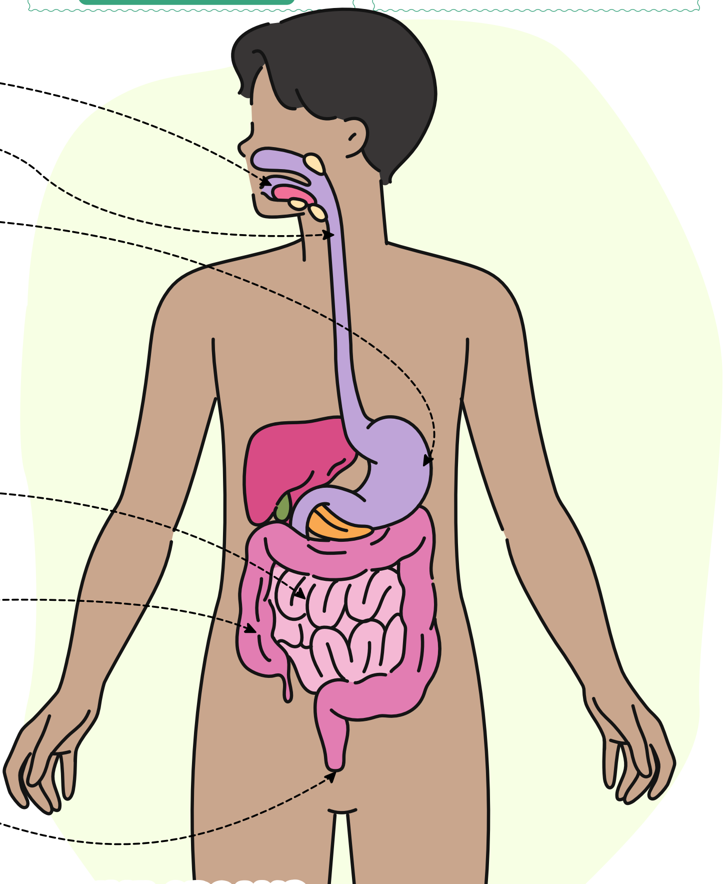
- → Digests contents from stomach
- → Absorption of water & electrolytes

### LARGE INTESTINE

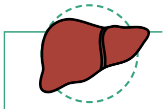
- → Absorption of water & electrolytes
- → Storage & elimination of waste

### ANUS

Excretion of waste

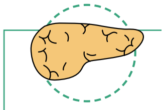


## ACCESSORY DIGESTIVE ORGANS



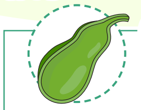
### LIVER

- → Metabolism of fats, proteins & carbs
- → Detoxification
- → Regulates blood sugar levels
- → Regulates blood clotting



### PANCREAS

- → Secretes glucagon and insulin
- → Secretes enzymes to break down foods
  - **LIPASE** → digests fats
  - **AMYLASE** → digests carbs
  - **PROTEASE** → digests protein



### GALL BLADDER

Stores **bile** produced by the liver

**BILE:**

- → Digests fatty foods
- → Absorbs fat soluble vitamins
- → Carries waste out of the liver

## DIGESTION PROCESS

| ① INGESTION | ② PROPULSION | ③ MECHANICAL DIGESTION | ④ CHEMICAL DIGESTION | ⑤ ABSORPTION | ⑥ DEFECATION |
|---|---|---|---|---|---|
| Act of ingesting or consuming something orally<br>**AKA EATING** | Movement of food along the digestive tract through **peristalsis** | Physically breaking down food substances into smaller particles | Food molecules broken down with enzymes | Products of digestion are absorbed by the blood to be supplied to rest of body | Elimination of undigested material from the body |

Involuntary contractions that move food through digestive tract

# GI SYSTEM ASSESSMENT

**TYPICAL ASSESSMENT ORDER:**

- I Inspection
- P Palpation
- P Percussion
- A Auscultation

**GI ASSESSMENT:**

- I Inspection
- A Auscultation
- P Percussion
- P Palpation

Order is changed to avoid altering bowel sounds

**TO PREPARE FOR ASSESSMENT ASK PATIENT TO:**

- ⋆ Empty bladder
- ⋆ Lie in supine position with pillow under the head

## 1 FOCUSED GI HISTORY

**ASK THE PATIENT ABOUT ANY:**

- → Change in appetite
- → Weight gain or loss
- → Difficulty swallowing (dysphagia)
- → Intolerance to certain foods
- → Nausea and vomiting
- → Change in bowel habits
- → Abdominal pain
- → Diarrhea or constipation

Could be early sign of **MALIGNANCY OR OTHER GI DISORDER**

## 2 INSPECTION

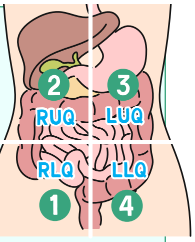
**ASSESS FOR:**

- → Bulges
- → Masses
- → Hernias
- → Ascites
- → Enlarged veins
- → Spider nevi

## 3 AUSCULTATION

**SEQUENCE OF QUADRANTS**

Start in RLQ & move **clockwise**



Auscultate for **1 full minute** to determine if:

| | |
|---|---|
| NORMAL | 5-30 bowel sounds per minute |
| HYPOACTIVE | <5 bowel sounds per minute |
| HYPERACTIVE | >30 bowel sounds per minute |
| ABSENT | No bowel sounds |

**COULD MEAN:** (hypoactive)

- ▸ Ileus
- ▸ Peritonitis
- ▸ Constipation
- ▸ Ischemic bowel disease

Must listen for at least **5 MINUTES** to confirm absent bowel sounds

**COULD MEAN:** (hyperactive)

- ▸ Bowel obstruction
- ▸ Malabsorption
- ▸ Infectious enteritis
- ▸ GI bleeding

## 4 PERCUSSION

**DULLNESS**

- → Soft, muffled, thud- like tone
- → Heard over fluid & solid structures (full bladder or liver)

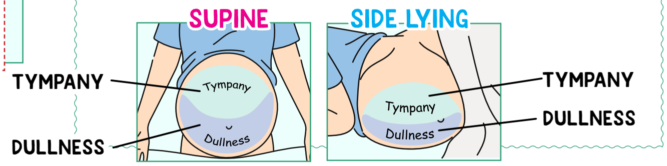
Hear elsewhere may indicate tumor or mass

**TYMPANY**

- → High pitched, drum-like sound
- → Heard over air filled structures (large intestine)

**IF ASCITES PRESENT:**

Will have shifting dullness/ tympany with position change



## 5 PALPATION

- → Use fingers of **dominant hand**
- → Use light, gentle, and dipping motions
- → Warm the palms before
- → Palpate clockwise

**LIGHT PALPATION (1–2 CM)**

Should feel soft with no rigidity or pain

**DEEP PALPATION (4–5 CM)**

Assess for tenderness, lumps, masses

**CONTRAINDICATED IF SUSPECTED:**

- → Abdominal aortic aneurysm
- → Appendicitis
- → Polycystic kidney disease
- → Kidney transplant
- → Tumor

No tenderness should be felt on LIGHT or DEEP palpation

## DIAGNOSTICS

**GUAIAC TEST:** stool sample to test for blood

**COLONOSCOPY:** Endoscope inserted through anus to visualize colon

**ESOPHAGOGASTRODUODENOSCOPY (EGD):** Endoscope inserted through mouth to visualize esophagus, upper GI tract, and duodenum

**SMALL BOWEL SERIES:** X-Rays taken after ingestion of contrast agent/barium to obtain clear picture of small bowel

# CHOLECYSTITIS

## WHAT IS IT?

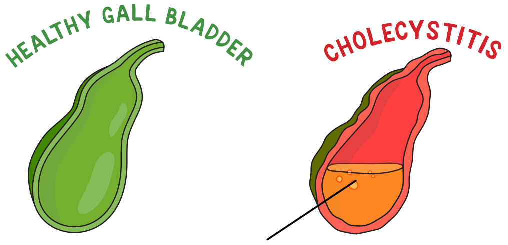
Inflammation of the **gall bladder**

**CHOLE** → Bile
**CYST** → Membranous sac
**ITIS** → Inflammation

The gall bladder is connected to the liver & stores **BILE**

**BILE HELPS:**

- ★ Digests fatty foods
- ★ Absorb fat soluble vitamins
- ★ Carry waste (including bilirubin) out of liver



Gall bladder becomes inflamed or blocked and **bile cannot exit properly**

If inflammation becomes severe enough can lead to **HEPATITIS** (liver inflammation) **OR PERFORATION** which can lead to **SEPSIS**

## RISK FACTORS

**REMEMBER THE 5 F'S**

- **F** **F**amily History
- **F** **F**emale
- **F** **F**at (obesity)
- **F** **F**orty or older
- **F** **F**ertile (pregnant)

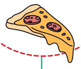
## DIAGNOSTICS

- → **HIDA SCAN:** assess for abnormal flow in gall bladder
- → **ABDOMINAL US:** will show thickening in gall bladder wall
- → **CT SCAN/ MRI**
- → **ERCP** (Endoscopic Retrograde Cholangiopancreatography): Diagnostic/ treatment procedure to visualize gall bladder with endoscope & x-rays after admin of dye

## SYMPTOMS

- → Severe RUQ/epigastric pain
- → Nausea/ vomiting
- → Bloating
- → Fever
- → Steatorrhea (fatty stools)
- → Tachycardia
- → Positive Murphy's Sign

**WILL GET WORSE** after a fatty meal



Breathing stops upon RUQ palpation while in supine position

## TREATMENT

- → Antibiotics for infection
- → Antiemetics for nausea
- → **Cholycysectomy:** removal of gall bladder
- → **ERCP:** Diagnostic & remove gall stones
- → **T-tube:** placed in common bile duct to drain bile
- → **Lithotripsy:** non-surgical procedure to break up stones

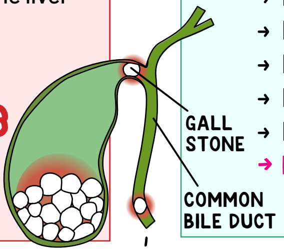
## SIGNS OF BILIARY OBSTRUCTION

If bile duct gets blocked, bile cannot leave the gall bladder, causing bile to back up into the liver

**SYMPTOMS**

- ▸ Jaundice
- ▸ Clay-colored stool
- ▸ Dark colored urine
- ▸ Pruritis
- ▸ Elevated AST/ALT & billirubin

Most commonly caused by **GALL STONES**



Gall stones are formed due to impaired metabolism of bile & get stuck in bile duct causing **INFLAMMATION**

## NURSING INTERVENTIONS

- → NPO preoperatively
- → NGT insertion (for gastric decompression)
- → IV fluids for hydration
- → Monitor VS & electrolytes
- → Monitor T-tube site & drainage
- → **NO FATTY FOODS**

# PANCREATITIS

## WHAT IS IT?

Inflammation of the **pancreas**

Occurs due to **AUTODIGESTION** of pancreas

Pancreatic duct becomes **blocked** & digestive enzymes can't move out of pancreas causing them to activate early while still in the pancreas, causing **INFLAMMATION & DAMAGE**

## THE PANCREAS HAS TWO MAIN FUNCTIONS:

### ENDOCRINE

Secretes insulin & glucagon to regulate blood glucose levels

### EXOCRINE

Secretes digestive enzymes

**LIPASE** → digests fats
**AMYLASE** → digests carbs
**PROTEASE** → digests protein

## CAUSES & RISK FACTORS

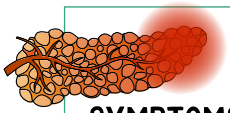
- **Alcohol abuse**
- **Gallstones**

MOST COMMON CAUSES

- Cholecystitis
- Cystic Fibrosis
- ERCP (can cause trauma to pancreatic duct)
- Smoking
- Hyperlipidemia

## DIAGNOSTICS

- **LABS**
  - ↑ Lipase & Amylase
  - ↑ Bilirubin
  - ↑ WBC
  - ↓ Calcium
  - ↑ Glucose
  - ↓ Platelets
- **CT SCAN:** may show enlarged pancreas
- **ERCP** (Endoscopic Retrograde Cholangiopancreatography): Diagnostic/ treatment procedure to visualize gall bladder & pancreatic ducts

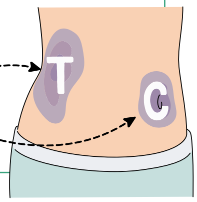


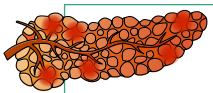
## ACUTE

Abrupt onset & recovery within a few days

### SYMPTOMS

- Epigastric LUQ pain that radiates to back
- Fever
- Tetany (from hypocalcemia)
- Nausea/ vomiting
- Turner sign (bruising on flank)
- Cullen sign (bruising around navel)





## CHRONIC

Persistent for months & may get worse overtime

### SYMPTOMS

- Chronic, persistent abdominal pain (worse after consuming fatty meals)
- Steatorrhea (fatty stool)
- Unintended weight loss (no enzymes to digest food)
- Dark urine (from excessive bile)

Chronic inflammation leads to **fibrosis** of pancreas tissue leading to **inability to produce digestive enzymes**

## COMPLICATIONS

### ARDS

Inflammatory chemicals leak into blood stream causing widespread inflammation & alveoli to fill with fluid

- Shortness of breath
- Restlessness
- Tachycardia

SIGNS OF HYPOXIA

### PERITONITIS

Bile or bacteria from the pancreas can leak into abdominal cavity causing inflammation of stomach lining

- Rigid board-like abdomen
- Rebound tenderness
- Fever

Can lead to **SEPSIS** if not treated promptly!

## TREATMENT

- **Antibiotics for infection**
- **Antiemetics for nausea**
- **Antacids:** decrease acid production
- **ERCP:** Diagnostic & remove gall stones

## NURSING INTERVENTIONS

- NPO at least 24 hrs (eating stimulates enzymes!)
- NGT insertion (for gastric decompression)
- IV fluids for hydration
- Opioid analgesics for pain
- Monitor for hyperglycemia
- Monitor VS & electrolytes
- Give pancreatic enzymes **before meals**

**DIET**

- Low fat
- Low sugar
- No alcohol

# INFLAMMATORY BOWEL DISEASE

Term that encompasses **TWO CONDITIONS** (**CROHN'S** & **ULCERATIVE COLITIS**)

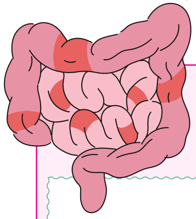
## SIMILARITIES

- Have **flare ups** & **remissions**
- Increase risk of colon cancer
- Cause inflammation & ulcers

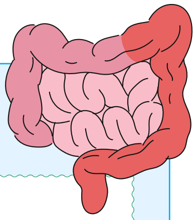
## CAUSES

**CAUSES NOT FULLY KNOWN**

- Genetics
- Illness
- Smoking
- Stress



## CROHN'S



## ULCERATIVE COLITIS

### PRIMARY DIFFERENCES

| | CROHN'S | ULCERATIVE COLITIS |
|---|---|---|
| **LOCATION** | Affects **entire GI tract** | Affects **colon & rectum** |
| **THICKNESS** | Affects **full thickness** of bowel wall | Affects **mucosa layer** of bowel wall |
| **ULCERATIONS** | Patchy & scattered (skip lesions) | Continuous throughout |

### SYMPTOMS

- Diarrhea (not usually bloody)
- Abscesses in bowel wall
- Mouth or GI ulcers
- RLQ pain

### COMPLICATIONS

- ☛ **MALNOURISHMENT:** if affects small intestine (site of nutrient absorption)
- ☛ **FISTULA:** abnormal tunnel forms between two body parts (worsening of abscess)
- ☛ **OBSTRUCTION:** from severe swelling & formation of scar tissue

### TREATMENT

**NO CURE:** goal is **symptom management**

- **Bowel Resection:** cut out diseased parts of bowel
- **Sulfasalazine:** ↓inflammation
- **Corticosteroids:** ↓inflammation & immune response
- **Antibiotics:** during flare ups to prevent infection
- Anti-diarrheals

### SYMPTOMS

- Severe diarrhea with pus/blood (10-20 stools/ day)
- Electrolyte imbalances
- Weight loss
- Bowel urgency

### COMPLICATIONS

- ☛ **TOXIC MEGACOLON:** dilation of colon due to severe inflammation
- ☛ **PERITONITIS:** severe inflammation can cause bowel to rupture
- ☛ **DEHYDRATION:** due to inability to absorb water from inflammation

### TREATMENT

**ONLY CURE IS:**
① Protocolectomy (+ permanent illeostomy)
② Ileoanal anastomosis (no ostomy)

- **Sulfasalazine:** ↓inflammation
- **Corticosteroids:** ↓inflammation & immune response
- **Antibiotics:** during flare ups to prevent infection
- Anti-diarrheals

## EDUCATION

### FOODS TO AVOID

- ✕ High fiber foods
- ✕ Hard to digest foods (nuts, raw vegetables)
- ✕ Spicy foods
- ✕ Gas causing foods (beans, onions)

### DURING FLARE UPS

- ★ Low fiber
- ★ High protein
- ★ Adequate water intake
- ★ Low residue

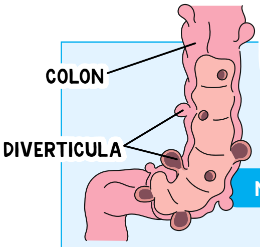
# DIVERTICULAR DISEASE

Two diseases that mainly affect the **LARGE INTESTINE**

**DIVERTICULA** form in weak spots of the colon
Small pouches that form on the intestinal walls

## RISK FACTORS

- Diet ↓fiber & ↑red meat
- Age (over 40)
- Smoking & alcohol abuse
- Genetics
- Obesity
- Medications (steroids, opioids, NSAIDs)
- Sedentary lifestyle



## DIVERTICULOSIS

Formation of **multiple** hollow pouches throughout the colon

**MOST COMMON SITE: SIGMOID COLON**

### SYMPTOMS

**Usually ASYMPTOMATIC until complications develop**

- → Change in bowel patterns (constipation or diarrhea)
- → Bloating
- → Mild cramping

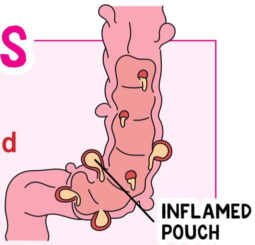
### COMPLICATIONS

**BLEEDING**
Arterial walls of intestine become weak overtime & rupture

- Painless bleeding
- Bright red stools
- Abdominal cramping

**OBSTRUCTION**
Narrowing of colon called strictures where stool can't pass

- Constipation
- Abdominal distention
- Vomiting



## DIVERTICULITIS

**Complication** of diverticulosis where pouches become **inflamed**

**Undigested food or stool gets trapped in pouches**

### SYMPTOMS

- → Severe LLQ pain
- → Bloating
- → Bloody stool
- → Nausea/ vomiting
- → Fever & chills

### COMPLICATIONS

**ABSCESS**
Pouches become infected & filled with pus

- Fever
- Elevated WBC
- Abdominal tenderness

**PERITONITIS**
Diverticulum rupture and contents spill into peritoneal cavity

- Rigid board-like abdomen
- Rebound tenderness
- Fever

## DIAGNOSTICS

**COLONOSCOPY:** endoscope inserted through rectum to assess colon for diverticula
**LABS:** WBC & inflammatory markers (CRP) will be elevated (Diverticulitis)
**CT SCAN:** assess for abnormalities in GI tract

Patients often find out they have **DIVERTICULOSIS** through routine **COLONOSCOPY**

### TREATMENT

Usually requires no treatment because **ASYMPTOMATIC**

**IF RECURRENT SYMPTOMS:**

- High fiber diet
- Fiber supplements
- Probiotics

### TREATMENT

- Antibiotics for infection
- OTC analgesics for pain (Acetaminophen)
- NPO (to rest bowel)
- IV fluids
- **Bowel resection** may be needed in severe cases

## EDUCATION

### DURING FLARE UP

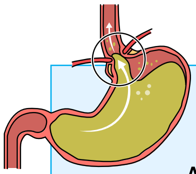
- NPO to rest bowel if severe
- No high fiber foods
- No solid foods
- Clear liquids for 2-3 days

### RECOVERY & MAINTENANCE

- ♥ Gradually introduce low fiber foods
- ♥ Build up to high fiber foods
- ♥ Psyllium supplements
- ♥ Adequate hydration

# GERD vs GASTRITIS vs PUD

Conditions that result from abnormal **ACID PRODUCTION**



## GERD

**GASTROESOPHAGEAL REFLUX DISEASE**

Acid backflow from stomach into esophagus

### RISK FACTORS

- Weak LES (lower esophageal sphincter)
- Obesity
- Pregnancy
- Hiatal hernia
- Smoking

### SYMPTOMS

- Heartburn
- Epigastric pain
- Regurgitation while supine
- Bitter taste in mouth
- Dry cough

### DIAGNOSTICS

- **EGD:** insert camera down esophagus to assess for erosion or changes
- **MANOMETRY:** assess ability of esophagus to squeeze food down

### TREATMENT

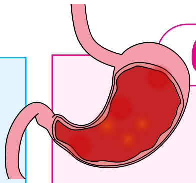
- Elevate head of bed

**MEDICATION**

- H2 Antagonists
- Proton Pump Inhibitors
- Antacids

**PROCEDURES**

- **Nissen Fundoplication:** wrapping fundus around lower esophagus



## GASTRITIS

Inflammation of the stomach lining

### RISK FACTORS

- H. pylori (bacteria)
- Long term NSAID use
- Stress
- Smoking
- Alcohol abuse

### SYMPTOMS

- Indigestion
- Nausea/ vomiting
- Bloating
- Abdominal pain
- Decreased appetite

### DIAGNOSTICS

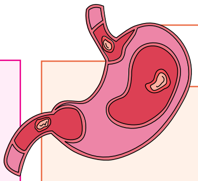
- **UREA BREATH TEST:** assess for presence of H. Pylori
- **EGD & BIOPSY:** sample is taken of GI lining to assess for bacteria

### TREATMENT

- IV fluids
- NPO if vomiting

**MEDICATION**

- H2 Antagonists
- Proton Pump Inhibitors
- Antacids
- Antibiotics for H. Pylori
- Antiemetics for nausea



## PUD

**PEPTIC ULCER DISEASE**

Ulcer formation in lining of GI tract

### RISK FACTORS

- H. pylori (bacteria)
- Long term NSAID use
- Stress
- Smoking
- Alcohol abuse

CAUSED BY **GASTRITIS**

### SYMPTOMS

**GASTRIC ULCER**

- Abdominal pain 30 m-1 hr after eating
- Eating makes it worse
- Bloody emesis

**DUODENAL ULCER**

- Abdominal pain 2-3 hrs after meals
- Eating makes it better
- Bloody stool

### DIAGNOSTICS

- **EGD:** assess for ulcers
- **CBC:** if actively bleeding
- **UREA BREATH TEST:** assess for H. Pylori

### TREATMENT

**MEDICATION**

- Antibiotics for H. Pylori
- H2 Antagonists
- Proton Pump Inhibitors
- Antacids
- **Sucralfate:** coats stomach lining

**IF ACTIVELY BLEEDING ULCER**

- **Cauterization:** stop bleeding
- **IV fluids:** maintain fluid volume
- Blood products

## EDUCATION

### LIFESTYLE MODIFICATIONS

- Smoking cessation
- Weight management
- Stress management
- Small, frequent meals
- Adequate hydration
- Probiotics

### AVOID

- ✕ Alcohol
- ✕ Spicy & fried foods
- ✕ Red meat
- ✕ Dairy
- ✕ Coffee & tea
- ✕ Citrus
- ✕ Peppermint
- ✕ Overeating
- ✕ Carbonated beverages
- ✕ NSAIDs

# GASTROINTESTINAL BLEED

Bleeding that occurs in the GI tract due to an **underlying cause**
↳Can range from MILD to LIFE-THREATENING

## UPPER GI BLEED

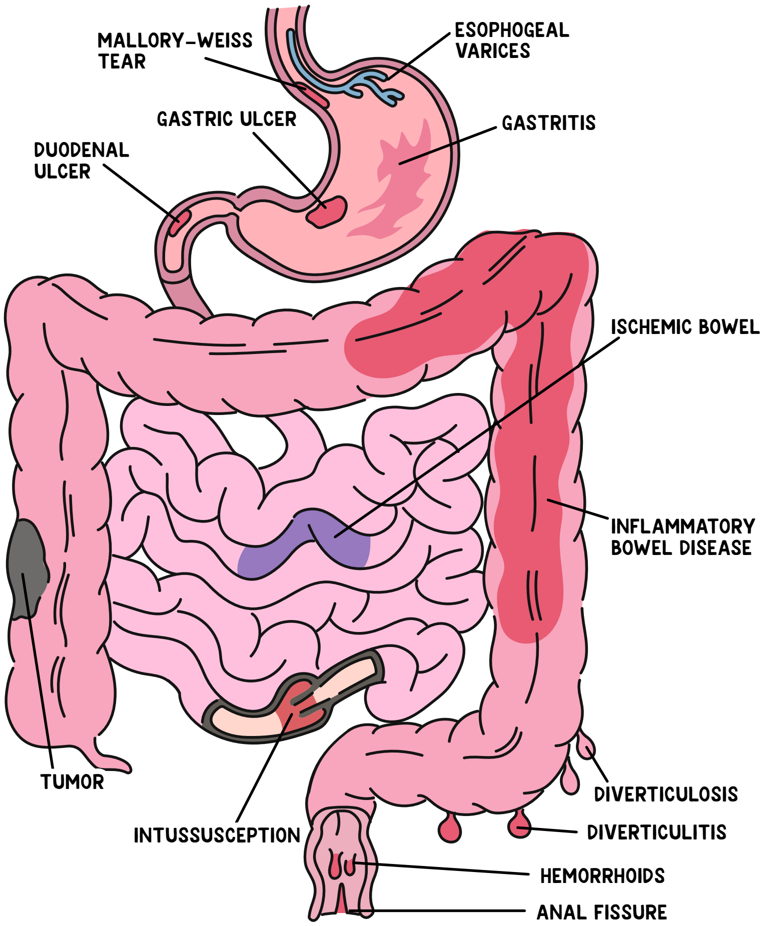
Bleeding occurs in the lining of esophagus, stomach or duodenum

### CAUSES

- Esophageal varices
- Mallory-weiss tear (tear in lower esophagus)
- Ulcers
- Erosive gastritis

### SYMPTOMS

- Dark, tarry stool
- Hemoptysis (bright red, bloody emesis)
- Tachycardia
- Abdominal pain
- Paleness
- Dizziness


MALLORY-WEISS TEAR
ESOPHOGEAL VARICES
GASTRIC ULCER
GASTRITIS
DUODENAL ULCER
ISCHEMIC BOWEL
INFLAMMATORY BOWEL DISEASE
TUMOR
DIVERTICULOSIS
INTUSSUSCEPTION
DIVERTICULITIS
HEMORRHOIDS
ANAL FISSURE

## LOWER GI BLEED

Bleeding occurs in the large intestine or rectum

### CAUSES

- Tumors
- IBD (Crohn's or Colitis)
- Hemorrhoids
- Anal Fissures
- Diverticulitis or Diverticulosis

### SYMPTOMS

- Frank, bright red blood in stool
- Tachycardia
- Abdominal pain
- Paleness
- Dizziness

### COMPLICATION: HYPOVOLEMIC SHOCK

Severe cases can lead to severe & acute blood loss

- ↓BP ↑HR ↑RR
- Pale, cool, clammy
- Confusion
- ↓ urine output

**MEDICAL EMERGENCY** ⚠

## DIAGNOSTICS

- **CBC:** will see drop in HGB
- **GUAIAC TEST:** to confirm bleeding
- **ENDOSCOPY:** assess & treat source of bleeding

## TREATMENT

- Find & treat source of bleeding (cauterization)
- Blood products (if active bleeding & ↓ HGB)
- **Protonix infusion:** ↓ acid to prevent further ulceration
- **Isotonic** fluids (NS or LR)
- **Vitamin K:** promote clotting

## NURSING INTERVENTIONS

**MONITOR**

- Vital signs
- EKG
- I & O
- Trends in hemoglobin
- Bowel movements (frequency & color)

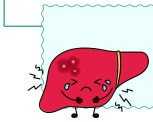
- Keep patient NPO
- Administer oxygen as needed
- Stop NSAIDs, aspirin & blood thinners

- Maintain 2 large bore IV's
- Make sure type & screen is current
- Fall precautions
  (may have orthostatic hypotension from bleeding)

# HEPATITIS

## WHAT IS IT?

Inflammation of the **liver**



| HEPAT | ITIS |
|---|---|
| Liver | Inflammation |

## MEMORY TRICK

**ACUTE TYPES= HEP A & E**

Both transmitted through fecal-oral route

**CHRONIC TYPES= HEP B, C & D**

All transmitted through blood & body fluids

ALL CONSANANTS

| TYPE | TRANSMISSION | DIAGNOSTICS | TREATMENT | PREVENTION |
|---|---|---|---|---|
| **HEPATITIS A**<br>ACUTE ONLY | Fecal-oral<br>(Contaminated food & water) | **ANTI-HAV**<br>▸ + IgM= **active** infection<br>▸ + IgG= **past** infection (recovered) | Rest & supportive treatment (resolves on own) | ▸ Hep A vaccine<br>▸ Hand hygiene |
| **HEPATITIS B**<br>ACUTE & CHRONIC | Blood & body fluids<br>(Childbirth, sex, IV drug use) | ▸ + HBsAg= **active** infection<br>▸ + Anti-HBS= **past** infection (recovered) | **ACUTE**<br>Supportive<br>**CHRONIC**<br>Anti-virals | ▸ Hep B vaccine<br>▸ Hand hygiene<br>▸ Sharp precautions |
| **HEPATITIS C**<br>ACUTE & CHRONIC | Blood & body fluids<br>(Childbirth, sex, IV drug use)<br>MOST COMMON AMONG IV DRUG USE | + Anti-HCV | **ACUTE**<br>Supportive<br>**CHRONIC**<br>Anti-virals | ▸ Hand hygiene<br>▸ Sharp precautions<br>NO VACCINE |
| **HEPATITIS D**<br>ACUTE & CHRONIC | Occurs in conjuction with **HEPATITIS B**<br>REMEMBER B & D ARE BEST BUDS | ▸ + Anti-HDV<br>▸ + HDAg (Hep D antigen) | **ACUTE**<br>Supportive<br>**CHRONIC**<br>Anti-virals | ▸ Hep B vaccine<br>▸ Hand hygiene<br>NO VACCINE |
| **HEPATITIS E**<br>ACUTE ONLY | Fecal-oral<br>(Contaminated food & water)<br>MOST COMMON IN 3RD WORLD COUNTRIES | + Anti-HEV | Rest & supportive treatment (resolves on own) | ▸ Fully cook food<br>▸ Hand hygiene<br>NO VACCINE |

## SYMPTOMS

- → Jaundice
- → Abdominal discomfort
- → Nausea/ vomiting
- → Dark urine
- → Clay-colored stools
- → Fatigue
- → Fever
- → ↑ AST/ ALT
- → ↑ Bilirubin
- → ↑ Ammonia

## EDUCATION

- ⋆ Strict hand hygiene
- ⋆ Do not share personal hygiene products
- ⋆ Eat small, frequent meals
- ⋆ Adequate rest (to allow liver to heal)
- ⋆ Avoid liver toxic meds (Acetaminophen + Aspirin)

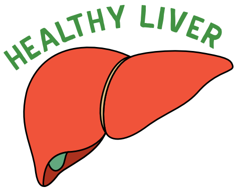
# CIRRHOSIS

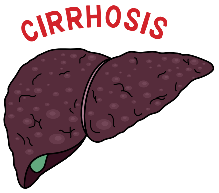
## WHAT IS IT?

Healthy liver cells are replaced with fibrotic (scar) tissue

Known as **END STAGE** liver disease

Once at this stage damage is **IRREVERSIBLE**!





**BUILD UP OF SCAR TISSUE** prevents liver from functioning normally (becomes hard & stiff from scarring)

### FUNCTIONS OF THE LIVER:

- ⋆ Produces bile to digest fats
- ⋆ Regulates clotting & glucose
- ⋆ Turns ammonia into urea
- ⋆ Makes albumin
- ⋆ Detoxifies the body
- ⋆ Metabolizes nutrients & drugs

Also connects to the **HEPATIC PORTAL VEIN**

Blood vessel that carries blood from **GI tract, spleen, gall bladder & pancreas** to the liver

## CAUSES & RISK FACTORS

- → **Chronic alcohol abuse**
- → **Chronic hepatitis (B, C & D)**
- → **Non-alcoholic fatty liver disease**
  - ▸ Obesity
  - ▸ Diabetes
  - ▸ Hyperlipidemia
- → Cystic fibrosis
- → Biliary cirrhosis (damage to biliary ducts)
- → Toxins & hepatotoxic drugs

## DIAGNOSTICS

**→ LABS**

- → ↑ AST & ALT
- → ↑ Bilirubin
- → ↑ Ammonia
- → ↓ Albumin & calcium (bind together)
- → ↓ Platelets
- → ↑ PT/PTT & INR

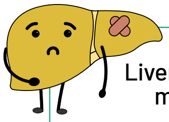
GOLD STANDARD

**LIVER BIOPSY:** sample taken to assess extent of damage to liver

**→ CT SCAN/ MRI:** assess for fatty tissue & damage

**→ ABDOMINAL US:** assess for ascites

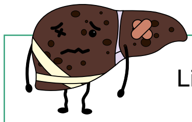
## SYMPTOMS



### EARLY SIGNS

Liver is able to cope with damage & maintain important functions

- → Fatigue
- → Hepatomegaly
- → Nausea/ vomiting
- → Abdominal pain
- → Decreased appetite



### LATE SIGNS

Liver is no longer able to maintain functioning due to damage

- → Jaundice
- → Ascites
- → Edema
- → Pruritis (itchy skin)
- → Clay-colored stool
- → Anemia
- → Bleeding & easily bruised
- → Portal hypertension
  - ▸ Splenomegaly
  - ▸ Caput madusae (enlarged veins on abdomen)

## COMPLICATIONS

### HEPATIC ENCEPHALOPATHY

High ammonia level in body causes toxic effects to brain

- ▸ Severe AMS
- ▸ Asterixis (flapping hand when extended)

### ESOPHOGEAL VARICES

Severe pressure from portal hypertension causes enlarged esophogeal veins

**HIGH RISK FOR HEMORRHAGE**

- ▸ No NGT tubes
- ▸ No straining

## TREATMENT

**MEDICATIONS**

- → **Lactulose:** ↓ ammonia
- → **Albumin:** ↓ ascites & edema
- → **Diuretics:** ↓ edema

Causes loss of ammonia through **STOOL** & deemed effective when patients mental status improves

**PROCEDURES**

- → **Paracentesis:** drain fluid in peritoneum (ascites)
- → Liver transplant

**DIET**

- ▸ No alcohol
- ▸ ↓ protein ↓ sodium
- ▸ Limit fluid intake

**BLEEDING PRECAUTIONS**

- ▸ Soft toothbrush
- ▸ Electric razor
- ▸ Monitor for bloody stools

# ACUTE LIVER FAILURE

## WHAT IS IT?

Sudden, rapid loss of liver function in patient without history of liver disease

**MEDICAL EMERGENCY** ⚠

**FOR DIAGNOSIS MUST HAVE:**

① Acute liver injury (↑ LFT)
② Coagulopathy (↑ INR)
③ Encephalopathy (AMS)

**& ONSET <26 WEEKS**
(unless reactivation of hepatitis or Wilson's disease)

## CAUSES

- Acetaminophen overdose **MOST COMMON**
- Toxins
  - Amanita phalloides (poisonous wild mushroom)
  - Alcohol or cocaine
- Hepatitis A, B, D & E
- Budd-Chiari syndrome (clot blocks hepatic veins)
- Wilson's disease (elevated copper levels)
- Malignancy
- HELLP Syndrome (pregnancy)
- Shock

## DIAGNOSTICS

### LABS

- ↑ AST & ALT
- ↑ Bilirubin
- ↑ Ammonia
- ↓ Platelets
- ↑ PT/PTT & INR
- ↑ Lactate

- **BLOOD CULTURES:** assess for infection
- **AUTOIMMUNE MARKERS:** assess for hepatitis
- **CT SCAN/ MRI/ ULTRASOUND**

## SYMPTOMS

- Jaundice
- RUQ pain
- Nausea and vomiting
- Fatigue
- Hepatic encephalopathy
- Ascites

## GRADES OF ENCEPHALOPATHY

| SEVERITY | CHARACTERISTICS |
|---|---|
| **GRADE I** | Behavioral changes<br>Altered sleep-wake cycle<br>Mild confusion |
| **GRADE II** | Lethargy<br>Moderate confusion<br>+ Asterixis |
| **GRADE III** | More severe confusion<br>Stuporous (wakes with stimulation)<br>Incoherant speech |
| **GRADE IV** | Coma<br>Unresponsive to stimuli |

## COMPLICATIONS

**CEREBRAL EDEMA:** Due to elevated ammonia
**SEPSIS:** Increased risk of infection due to liver injury
**BLEEDING/ CLOTTING:** liver regulates coagulation
**HYPOGLYCEMIA:** Liver stores glycogen

## TREATMENT

**FIND & TREAT UNDERLYING CAUSE!**

### MEDICATIONS

- **Acetylcysteine:** antidote for acetaminophen
- **Osmotic diuretics:** ↓ cerebral edema
- FFP or Vitamin K for bleeding
- **Lactulose:** ↓ ammonia

### PROCEDURES

- Emergent liver transplant (in severe cases)

## NURSING INTERVENTIONS

**WILL NEED ICU MANAGEMENT**

- Prepare for possible intubation
- Bleeding precautions
- Keep HOB elevated 30 degrees

### CLOSE MONITORING

- Q1 neuro checks
- Continuous VS & heart monitoring
- Blood glucose checks
- ICP monitoring
- I & O

# BOWEL OBSTRUCTION

## WHAT IS IT?

Blockage in bowel prevents effective absorption & elimination

**BLOCKAGE CAN BE PARTIAL OR COMPLETE**

**PARTIAL:** GI tract is **narrowed** but some contents can still pass through

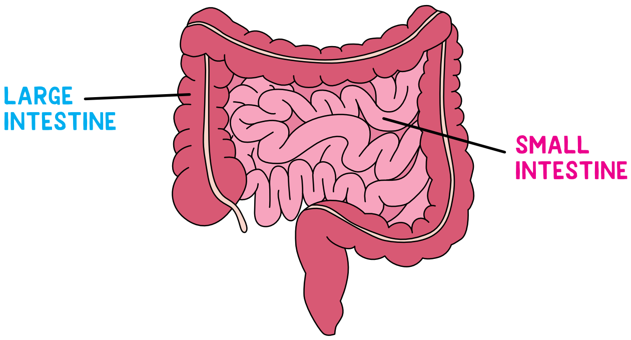
**COMPLETE:** GI tract is **completely blocked** & nothing can pass through

**MEDICAL EMERGENCY**

↓ blood flow to bowel causes tissue death & can lead to **PERFORATION & SHOCK**

Can affect both the

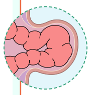
**SMALL & LARGE INTESTINE**



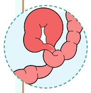
## TYPES OF BOWEL OBSTRUCTION

### MECHANICAL

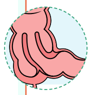
**Physical blockage** in bowel preventing movement



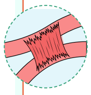
**HERNIA**
Portion of intestine protrudes into other part of body



**VOLVULUS**
Intestine twists around itself



**INTUSSUSCEPTION**
Part of bowel telescopes into adjacent segment



**ADHESIONS**
Bands of scar tissue form between bowel loops

**OTHER CAUSES:**
Foreign body, tumor, fecal impaction

### FUNCTIONAL

Muscles & nerves not working properly & **disrupt peristalsis**

**AKA PARALYTIC ILEUS**

- Abdominal surgery
- Gastroenteritis
- Hypothyroidism
- Sepsis
- Medications
  - Opioids
  - Anticholinergics
- Neuromuscular disorders
  - Parkinson's
  - Spinal cord injury

## SYMPTOMS

### SMALL BOWEL OBSTRUCTION

- Colicky abdominal pain
- Frequent nausea/ vomiting
- Severe fluid & electrolyte imbalances
- Metabolic alkalosis

### LARGE BOWEL OBSTRUCTION

- Lower abdominal cramping
- Abdominal distention
- Vomiting fecal matter (late sign)
- Constipation

**HYPERACTIVE BS ABOVE BLOCKAGE**
**&**
**HYPOACTIVE BS BELOW BLOCKAGE**

## DIAGNOSTICS

- **ABDOMINAL X-RAY:** assess for presence of gas or fluid
- **CT SCAN W/ CONTRAST:** assess for cause of obstruction
- **LABS:** CBC & BMP

## TREATMENT

**PARTIAL OBSTRUCTIONS MAY RESOLVE WITHOUT SURGERY**

- IV fluids
- **ANTIBIOTICS:** for infection
- **ANTIEMETICS:** for nausea
- **NGT PLACEMENT:** for gastric decompression
- **COLON RESECTION:** removal of part of the colon
- **COLOSTOMY:** part of colon redirected through opening in abdomen (stoma)

## NURSING INTERVENTIONS

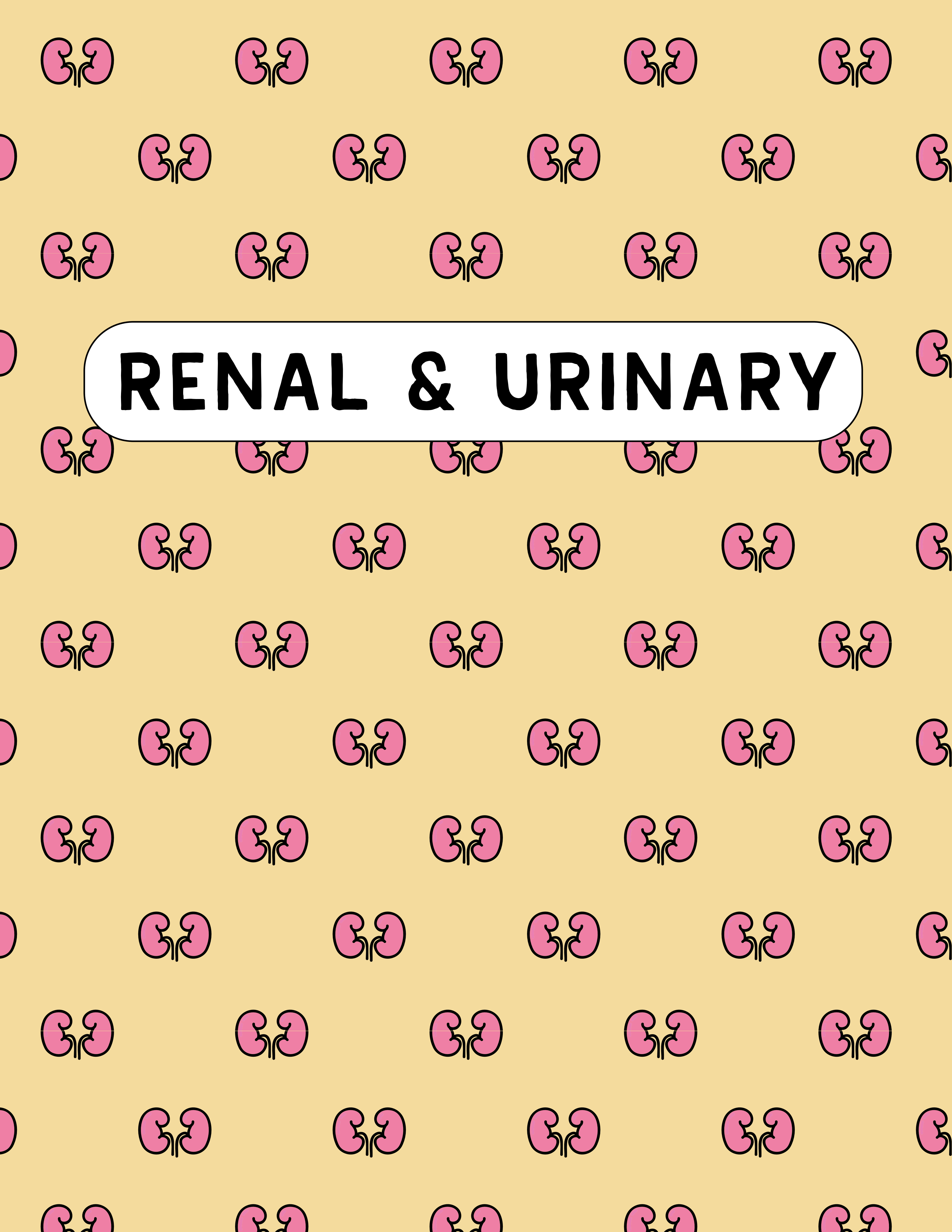
- Keep patient NPO
- Ostomy care + education
  (also contact wound care RN)
- Emotional support
- Pain management

### MONITOR

- NGT output (amount & color)
- Electrolytes
- Bowel sounds
- VS & heart monitoring
- I & O

### EDUCATION

- Small, frequent meals
- Eat slowly & chew thoroughly
- Adequate hydration
- Low fiber 6-8 weeks
- Avoid foods that cause gas
- Add new foods back slowly



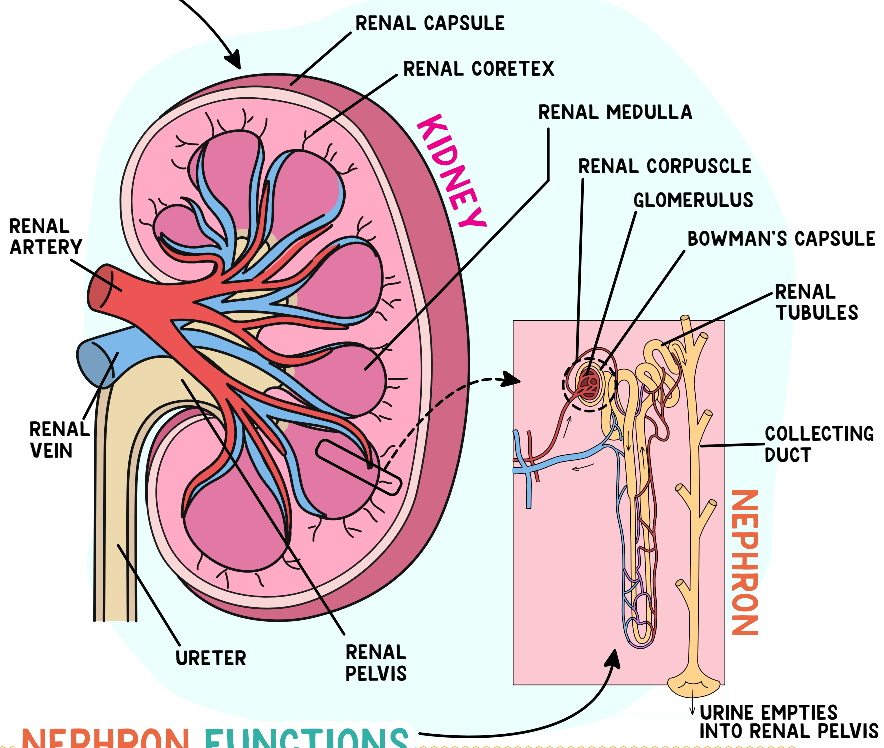
# RENAL & URINARY

# RENAL SYSTEM OVERVIEW

## KIDNEY FUNCTIONS

REMEMBER **"A WET BED"**

- **A** Acid-base balance
- **W** Water balance
- **E** Electrolyte balance
- **T** Toxin removal
- **B** Blood pressure control
- **E** Erythropoietin production
- **D** D metabolism
  - Vitamin D is used for **calcium absorption**


RENAL CAPSULE
RENAL CORETEX
RENAL MEDULLA
KIDNEY
RENAL CORPUSCLE
GLOMERULUS
BOWMAN'S CAPSULE
RENAL ARTERY
RENAL TUBULES
COLLECTING DUCT
RENAL VEIN
NEPHRON
URETER
RENAL PELVIS
URINE EMPTIES INTO RENAL PELVIS

## URINE FORMATION

OCCURS IN NEPHRON

### 1 GLOMERULAR FILTRATION

Blood enters through **afferent arteriole** & is filtered through the glomerulus

AKA **GFR**

**FILTERS 125 ML/ MIN**

### 2 REABSORPTION

Parts of the filtrate is reabsorbed from the renal tubules back to the blood

non-filterable components (proteins & blood cells ) exit through **efferent arteriole**

### 3 SECRETION

Substances taken out of filtrate to be excreted in the urine

### 4 EXCRETION

Flow of urine into the urinary tract from the renal pelvis to the urethra

## NEPHRON FUNCTIONS

① Filters blood (glomerulus)
② Reabsorbs minerals & water (renal tubule)
③ Secretes waste (renal tubule)
④ Produces urine (collecting duct)

**THERE ARE ABOUT 1 MILLION NEPHRONS IN EACH KIDNEY!**

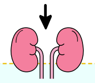
## RAAS

### RENIN–ANGIOTENSIN–ALDOSTERONE SYSTEM

Multi-organ feedback mechanism that regulates blood pressure by managing fluid & electrolyte balance & vascular tone

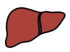
**↓ BP CAUSES ↓ BLOOD FLOW TO KIDNEYS** — TRIGGER OF CYCLE

↓



**KIDNEYS**
Release **renin**

↓

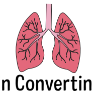


Angiotensinogen is released by the **LIVER**

**Renin** converts Angiotensinogen into
**ANGIOTENSIN I**

↓

Angiotensin I is converted to
**ANGIOTENSIN II**
by **Angiotensin Converting Enzyme**

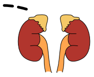


Angiotensin Converting Enzyme (ACE) is released by the **LUNGS**

↓

**ANGIOTENSIN II CAUSES**

- **↑ NA & WATER REABSORPTION** due to vasoconstriction of **afferent arterioles**
- **VASOCONSTRICTION** of peripheral blood vessels
- **ALDOSTERONE RELEASE** causes ↑ Na & water reabsorption in kidneys



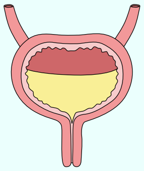
Aldosterone is released by the **ADRENAL CORTEX**

↓

↑ sodium & fluid retention + vasoconstriction=
**↑ BLOOD PRESSURE**

# URINARY ASSESSMENT

## NORMAL URINE OUTPUT



**AT LEAST 30 ML/ HR**

Average adult output is **1500 ML/ DAY**

## NORMAL LAB VALUES

### GFR (GLOMERULAR FILTRATION RATE)

How much blood kidneys filter per minute

- NORMAL: 90–120 ML/ MIN
- KIDNEY DAMAGE: <60 ML/ MIN
- KIDNEY FAILURE: <15 ML/ MIN

LOW GFR = ↓ urine output & ↑ toxins in blood

### CREATININE

By-product of muscle breakdown

NORMAL: 0.6–1.2 MG/DL

**REASONS FOR:**

| ↑ CREATININE | ↓ CREATININE |
|---|---|
| ▸AKI or CKD | ▸↓ protein intake |
| ▸Heart failure | ▸Liver disease |
| ▸Dehydration | ▸↓ muscle mass |

### BUN (BLOOD UREA NITROGEN)

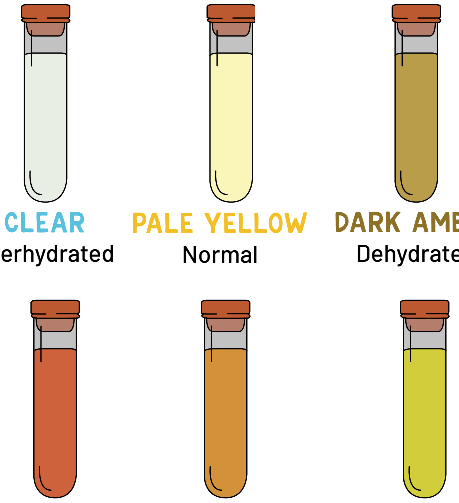
By-product of protein metabolism

NORMAL: 6–20 MG/DL

**REASONS FOR:**

| ↑ BUN | ↓ BUN |
|---|---|
| ▸Urine obstruction | ▸Liver damage |
| ▸Dehydration | ▸Overhydration |
| ▸Renal disease | ▸Malnutrition |

## URINE COLOR MEANINGS



| Color | Meaning |
|---|---|
| CLEAR | Overhydrated |
| PALE YELLOW | Normal |
| DARK AMBER | Dehydrated |
| RED/PINK | Blood (hematuria) |
| ORANGE | • Liver damage<br>• Meds (pyridium & rifampin) |
| GREEN/ BLUE | • Bacterial infection<br>• Meds (propofol) |

## ASSESSMENT TERMS

**ANURIA:** Output <50 mL per day

**OLIGURIA:** Output <20 ml/hour or <400 ml/day

**HEMATURIA:** Blood in urine

**PROTEINURIA:** Protein in urine

**NOCTURIA:** Frequent urination at night

**DYSURIA:** Painful urination

**URGENCY:** Sudden, strong need to urinate

**FREQUENCY:** Needing to urinate more often than usual

**INCONTINENCE:** Loss of bladder control

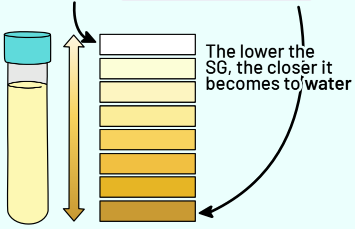
## NORMAL URINE VALUES

### SPECIFIC GRAVITY

Measures concentration of dissolved solutes in urine

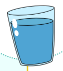
NORMAL: 1.005 TO 1.030

LOW= DILUTE | HIGH= CONCENTRATED



The lower the SG, the closer it becomes to water

THE SPECIFIC GRAVITY OF WATER IS 1



### URINE OSMOLALITY

- ▸ Not part of routine urinalysis
- ▸ More accurate test to measure urine concentration

NORMAL: 300–900 MOSM/KG

<300= DILUTE | >300= CONCENTRATED

**Specific gravity** is easily influenced by the size of particles in urine, whereas **osmolality** focuses solely on the number of particles in urine

### PH

Acid-base balance of urine (not the same as blood pH)

NORMAL: 4.6 TO 8

### ABNORMAL FINDINGS

- + **GLUCOSE:** may indicate ↑ blood glucose
- + **KETONES:** may indicate DKA
- + **PROTEIN:** may indicate kidney disease
- + **BLOOD:** may indicate trauma, UTI, cancer
- + **NITRITES:** may indicate infection
- + **BILIRUBIN:** may indicate liver disease

# ACUTE KIDNEY INJURY

## WHAT IS IT?

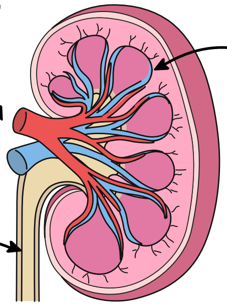
Sudden decline in renal function

**ABRUPT BUT REVERSIBLE**

Causes build up of waste & fluid and electrolyte imbalances

Can lead to **CHRONIC KIDNEY DISEASE** which is **IRREVERSIBLE** if not treated promptly!

## DAMAGE CAN BE:



**PRERENAL**
Damage **before** the kidneys

**INTRARENAL**
Damage **within** the kidneys

**POSTRENAL**
Damage **after** the kidneys

## CAUSES

### PRERENAL

Damage before kidney causes ↓ blood flow to kidneys

**↓BLOOD FLOW = ↓ O2 TO KIDNEYS**

**HYPOTENSION**
- Shock
- Hypovolemia
- Dehydration

**↓ CARDIAC OUTPUT**
- Myocardial infarction
- Heart failure

**OBSTRUCTION**
- Tumor
- Emboli

### INTRARENAL

Damage to kidneys causes ↓ functioning of kidneys

**MOST SEVERE**

**INFECTION**
- Glomerulonephritis
- Lupus (Lupus Nephritis)

**NEPHROTOXINS**
- CT contrast dye
- Antibiotics (Vancomycin & Gentamicin)

**INJURY**
- Rhabdomyolysis (damaged muscle tissue releases myoglobin & damages kidneys)

### POSTRENAL

Damage after kidneys causes obstruction

**URINE BACKS UP INTO KIDNEYS**

**ANYTHING THAT CAUSES BLOCKAGE**
- Renal calculi (stones)
- Tumors
- BPH (enlarged prostate)
- Neuro damage causing retention (stroke)

## PHASES of AKI

**PHASE 1: ONSET** (Initial injury)

### PHASE 2: OLIGURIA

Glomerulus not filtering properly

**<400 ML IN 24 HOURS**

- ↑ specific gravity
- ↑ BUN/ Cr
- Edema
- Hypertension
- Metabolic acidosis
- Electrolyte imbalances
  - ↓NA ↓CA ↑K+ ↑P

### PHASE 3: DIURESIS

Kidneys trying to correct problem by flushing out fluid & waste

- **HIGH** urine output (3-6L/day)
- ↓ specific gravity
- Lab values beginning to correct

### PHASE 4: RECOVERY

Slowly returning to normal

- Can take up to one year to fully recover
- Some patients may not recover & develop CKD

## TREATMENT

**FIND & TREAT UNDERLYING CAUSE**

1ST LINE TX FOR ↑K+ WITH EKG CHANGES

- **Fluids:** flush out kidneys
- **Diuretics:** ↓ excess fluid
- Antihypertensives
- **Calcium gluconate:** for hyperkalemia
- **Sodium bicarbonate:** correct acidosis
- **Dialysis:** if severe

## NURSING INTERVENTIONS

- Strict I & O
- Daily weights
- Monitor VS & EKG
- Neuro checks
- Labs & electrolytes

**DIET**
- ↓ sodium
- limit fluids
- ↓ potassium
- ↓ phosphate

# CHRONIC KIDNEY DISEASE

## WHAT IS IT?

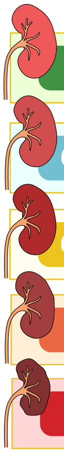
**Progressive** decline in renal function

**SLOW AND IRREVERSIBLE**

## DAMAGE MEASURED BY GFR

↳ Ability of glomerulus to filter blood

## CKD STAGES



| | | |
|---|---|---|
| GFR › 90 | **STAGE 1** | Kidney damage with normal renal function |
| GFR 60–89 | **STAGE 2** | Kidney damage with mild loss of function |
| GFR 30–59 | **STAGE 3** | Mild to moderate loss of renal function |
| GFR 15–29 | **STAGE 4** | Severe loss of renal function |
| GFR ‹15 | **STAGE 5** | End stage renal disease |

## CAUSES

- → Older age (lose function over time)
- → **Long term damage**
  - ▸ Uncontrolled diabetes
  - ▸ Uncontrolled hypertension
  - ▸ Uncontrolled autoimmune disease
- → Infection
- → Nephrotoxic drugs
- → Acute renal failure
- → Polycystic kidney disease

## SYMPTOMS

- → Oliguria or anuria
- → Arrhythmias (from ↑K+)

**↓ GFR= ↑ WASTE IN BODY**

- → Uremic frost (urea crystals on skin)
- → Pruritis (from uremic frost)
- → Metabolic acidosis

**HYPERVOLEMIA**

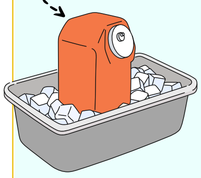
- → Hypertension
- → Edema
- → JVD
- → Crackles & dyspnea

**ANEMIA**

- → Pallor
- → Fatigue

## DIAGNOSTICS

→ **CREATININE CLEARANCE TEST:** 24 hour urine collection to assess how well kidneys are filtering waste



- ▸ 24 hour collection of all urine
- ▸ First specimen is discarded
- ▸ Kept on ice
- ▸ Compared to blood creatinine

**LABS**

- → ↑ Potassium
- → ↑ Phosphorous
- → ↑ Magnesium
- → ↑ Sodium
- → ↓ Calcium
- → ↑ BUN/ Cr
- → ↓ HGB/ HCT
  - ↳ Kidneys produce **erythropoietin** to stimulate RBC production, so RBC will be decreased with CKD

→ **URINALYSIS:** may see hematuria & proteinuria

## TREATMENT

**MEDICATIONS**

- → **Kayexalate:** ↓ potassium
- → **Diuretics:** ↓ excess fluid
- → **Epoetin alpha:** ↑ RBC production
- → **IV Regular Insulin & D50:** ↓ potassium quickly with dysrythmias present
- → **Calcium Acetate:** phos binder to ↓ phosphate
  (Give with or immediately after meals)

If K+ DANGEROUSLY HIGH give **Calcium Gluconate** 1st to stabilize cardiac membranes
↳ **THEN** give insulin & glucose

**PROCEDURES**

- → **Dialysis:** for later stage CKD
- → Kidney transplant

## NURSING INTERVENTIONS

**MONITOR**

- → Daily weights
- → Strict I & O
- → VS & heart rhythm
- → Edema & skin

**DIET**

- → ↓ sodium
- → ↓ potassium
- → ↓ phosphate
- → ↓ protein
- → limit fluids

**AVOID**

- ⊘ NSAIDs
- ⊘ Contrast dye
- ⊘ Magnesium containing antacids (Maalox & Mylanta)

# BENIGN PROSTATIC HYPERPLASIA

## WHAT IS IT?

Tissue overgrowth of the **prostate**

| **BENIGN** | **PROSTATIC** | **HYPERPLASIA** |
|---|---|---|
| Non- cancerous | Prostate | Enlargement |

Enlarged prostate pushes against bladder & urethra leading to **URINARY BLOCKAGE**

## RISK FACTORS

- → More common in men >50
- → Family history
- → Sedentary lifestyle
- → Smoking
- → Hormonal imbalances (↑ estrogen & ↑DHT)

## SYMPTOMS

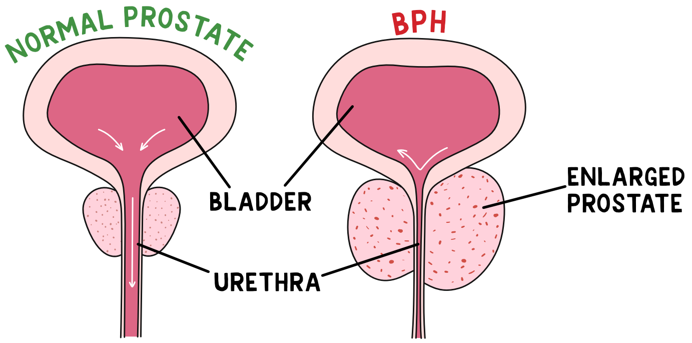
All symptoms due to urine flow becoming partially **BLOCKED**

- → Weak urine stream
- → Urinary frequency & urgency
- → Urinary incontinence
- → Incomplete bladder emptying
- → Post-void dribbling
- → Difficulty starting urination
- → Nocturia & dysuria
- → Frequent UTI's
- → Hematuria

## NURSING INTERVENTIONS

- → Strict I &O
- → Daily weights
- → Monitor for bladder distention
- → Timed voiding schedule
- → Encourage fluid intake to prevent UTI
- → Avoid bladder irritants (caffeine)
- → Insert foley catheter per facility protocol for urinary retention

**MAY BE DIFFICULT TO INSERT DUE TO LARGE PROSTATE**
Never force catheter to avoid trauma; urology may need to be consulted to place **coude catheter**



## DIAGNOSTICS

- → **DIGITAL RECTAL EXAM:** Palpation of prostate gland through rectal wall to assess for enlargement
- → **PROSTATE SPECIFIC ANTIGEN**

**LEVEL >4 MAY INDICATE BPH**

Also elevated in prostate cancer; **further testing required**

## TREATMENT

### MEDICATIONS

- → **Finasteride:** prevents conversion of testosterone to ↓ prostate size
- → **Tamsulosin:** relaxes muscles in prostate to improve urine flow
- → **Antispasmodics** (Oxybutinin): ↓ spasms that cause restriction

### PROCEDURES

- → **TUNA (Transurethral Needle Ablation):** uses radiofrequency to destroy extra prostate tissue
- → **TURP (Transurethral Resection of Prostate):** surgical removal of section of prostate

**WILL REQUIRE CONTINUOUS BLADDER IRRIGATION POST-OP**

Three-way catheter that continuously infuses saline into the bladder to prevent/ remove clots after surgery

**GOAL: LIGHT PINK DRAINAGE**

- ▸ If output is red or contains clots, rate should be increased
- ▸ If output is clear, rate should be decreased
- ▸ If obstruction is expected, turn off CBI & irrigate

**WILL NEED TO CLOSELY MONITOR OUTPUT & COMPARE IT TO AMOUNT OF SALINE INFUSED INTO BLADDER**
If amount of output is **less than amount infused**, indicates an **obstruction** (check for kinks & irrigate)

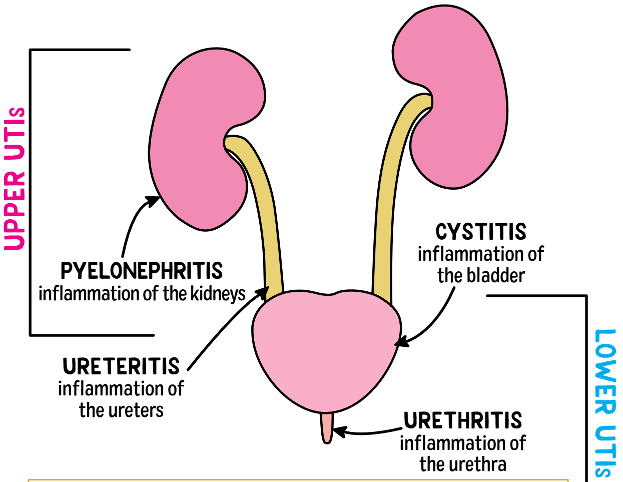
# URINARY TRACT INFECTION

## WHAT IS IT?

Infection found within the urinary tract caused by bacteria, virus, or fungus

**MOST COMMON CAUSE: E. COLI**

Most commonly found in the bladder (cystitis) & can travel up the urinary tract leading to a **serious infection** of the **KIDNEYS (PYELONEPHRITIS)**


UPPER UTIs
PYELONEPHRITIS
inflammation of the kidneys
CYSTITIS
inflammation of the bladder
URETERITIS
inflammation of the ureters
URETHRITIS
inflammation of the urethra
LOWER UTIs

**UTIs TYPICALLY START LOW & SPREAD UP**

## RISK FACTORS

- More common in women (shorter urethra & closer to rectum)
- Indwelling urinary catheters
- Renal calculi
- Urinary retention
  - BPH
  - Neuro damage
  - Holding bladder too long
- Hormonal changes (pregnancy)
- Diabetes (↑ glucose is a breeding ground for bacteria!)

## DIAGNOSTICS

- **URINE CULTURE & SENSITIVITY:** identify type of pathogen
  - Always draw cultures first **BEFORE** giving antibiotics
- **URINALYISIS**
  - **UA FINDINGS:**
    - + Bacteria
    - + WBC
    - + Leukocyte esterase
    - + Blood
    - + Nitrites

## SYMPTOMS

- Dysuria
- Urinary frequency & urgency
- Foul smelling urine
- Cloudy urine
- Abdominal cramping
- Fever

**ELDERLY PATIENTS**

May show new:

- **Confusion**
- Incontinence
- Agitation or lethargy

## TREATMENT

### MEDICATIONS

- **Antibiotics** (always take culture sample first!)
- **Pyridium:** ↓ urinary urgency & pain

**EDUCATION:** May turn urine orange

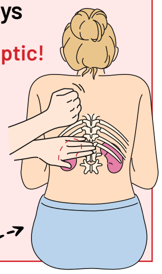
### SUPPORTIVE CARE

- IV fluids/ encourage fluid intake
- Cranberry supplements
- Remove catheter if present

## COMPLICATION: PYELONEPHRITIS

UTI spreads up ureters to the **kidneys**

Can spread to blood & become septic!



- Fever & chills
- Nausea/ vomiting
- Costovetebral angle tenderness
  - **dull flank pain** that extends towards navel

### HOW TO ASSESS CVA TENDERNESS

① Stand facing patient's back
② Place hand over CVA (below 12th rib in between spine)
③ Firmly thump hand with fist of opposite hand
④ Assess if patient felt tenderness or pain

## EDUCATION

- ⋆ Wear cotton underwear
- ⋆ Take showers, not baths
- ⋆ Wipe front to back
- ⋆ Void every 2-3 hours
- ⋆ Meticulous perineal care
- ⋆ Urinate after intercourse
- ⋆ No douching
- ⋆ Avoid caffeine & alcohol
- ⋆ No perfumes or sprays
- ⋆ Finish full ABX course

# GLOMERULONEPHRITIS

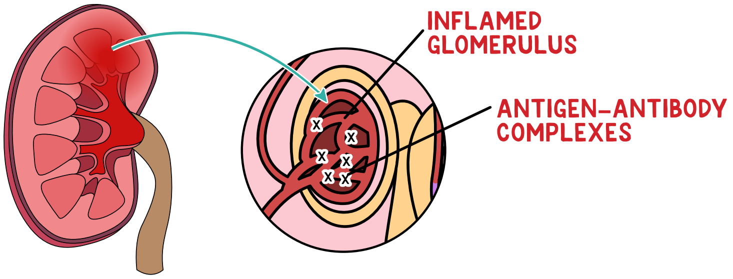
## WHAT IS IT?

Inflammation of the **glomeruli**

**PART OF THE NEPHRON**
(FUNCTIONAL UNIT OF THE KIDNEYS)

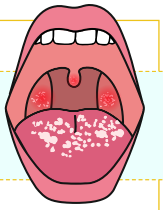
**FUNCTION OF GLOMERULUS:**

- ⋆Acts as main filtering unit of nephron
- ⋆Filters waste & excess fluid
- ⋆Does not allow passage of molecules body needs (RBC & protein)



## CAUSES

**MOST COMMON CAUSE:**
Recent **group A beta hemolytic streptococcus** infection



OTHER CAUSES:

**PRIMARY CAUSES**
- Sepsis
- Varicella
- HIV
- Epstein-Barr

**SECONDARY CAUSES**
- Lupus
- Hepatitis
- Cirrhosis
- Hypertension

**ANTIGEN-ANTIBODY COMPLEXES** made against the strep infection are what causes inflammation, not the strep infection itself!

**ANTIGEN-ANTIBODY COMPLEXES GET STUCK IN GLOMERULI**

↓

**GLOMERULI BECOME INFLAMED & DAMAGED CAUSING:**

- Fluid to back up (glomeruli usually filter excess fluid)
- Leakage of protein & RBC's (glomeruli usually keep them from moving into urine)
- Low urine output (glomeruli are the start of the urine formation process)

## SYMPTOMS

- → Oliguria
- → Brown, tea-colored urine (blood in urine)

**HYPERVOLEMIA**
- → Hypertension
- → Edema
- → JVD
- → Crackles
- → Dyspnea

Fluid is backing up because glomeruli are not working to filter out excess fluids

## DIAGNOSTICS

- → **THROAT CULTURE:** + group A hemolytic strep
- → **+ ASO** (ANTISTREPTOLYSIN) **TITER:** antibodies for strep infection
- → **URINALYISIS:** + protein (mild), + RBC, ↑ specific gravity
- → **LABS:** ↑ BUN/ Cr ↑ WBC ↑ ESR & CRP **+ ↓ GFR!**

## TREATMENT

**GOAL:** Protect kidneys from further damage & treat underlying cause

### MEDICATIONS
- → **Antihypertensives:** ↓ BP
- → **Antibiotics:** treat underlying infection
- → **Diuretics:** ↓ excess fluid
- → **Corticosteroids:** ↓ inflammation

### PROCEDURES
- → **Plasmapharesis:** filter out antibody complexes
- → Dialysis or kidney transplant may be indicated for chronic cases

## NURSING INTERVENTIONS

### MONITOR
- → Daily weights
- → Strict I &O
- → Urine color & appearance
- → VS & heart rhythm
- → Edema & skin
- → Electrolytes & labs
- → Bedrest until acute symptoms resolve

### DIET
- ↓ sodium
- ↓ protein
- limit fluids

### EDUCATION:
Treat strep infections early!

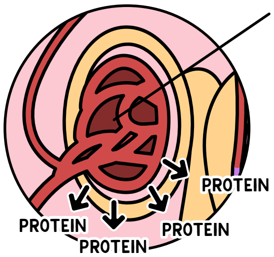
# NEPHROTIC SYNDROME

## WHAT IS IT?

A **group of symptoms** that occur in response to structural damage of the glomeruli

CHARACTERIZED BY
**MASSIVE LOSS OF PROTEIN IN THE URINE**

Compared to **GLOMERULONEPHRITIS** which is just **inflammation** of the glomeruli & causes **mild** loss of protein



**DAMAGE TO GLOMERULUS**

Glomerulus unable to keep proteins from being filtered, causing **mass leakage of protein**

↓

MAIN PROTEIN LOST IS **ALBUMIN** WHICH **REGULATES ONCOTIC PRESSURE**

Keeps fluid from leaking into tissues

## CAUSES

**PRIMARY** (DIRECT PROBLEM IN KIDNEY)

- Minimal Change Disease
  (changes to glomeruli; cause unknown)
- Glomerulosclerosis
  (scarring in glomeruli)

**SECONDARY** (DISEASE CAUSING DAMAGE)

- Lupus
- Diabetes
- Hepatitis
- CHF
- HIV
- Nephrotoxic drugs (NSAIDs)

## DIAGNOSTICS

→ **LABS**

- ↓ albumin
- ↑ triglycerides
- ↑ cholesterol
- ↑ BUN/ Cr
- ↓ GFR

→ **URINALYISIS:** will show massive protein loss (>2+)

→ **24 HOUR URINE SAMPLE:** protein > 3.5 g/dL

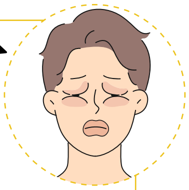
→ **RENAL ULTRASOUND:** assess for cause

→ **RENAL BIOPSY:** assess for cause

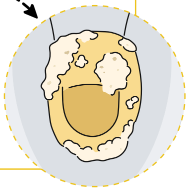
## SYMPTOMS

**EDEMA** (from ↓ albumin)

- Periorbital (around eyes)
- Peripheral edema
- Ascites



- Frothy urine (from ↑ protein)
- Weight gain
- Loss of appetite
- Fatigue



## TREATMENT

**MEDICATIONS**

- **Corticosteroids:** ↓ inflammation
- **Diuretics:** ↓ excess fluid
- **Albumin & plasma:** ↓ edema
- **STATIN's:** ↓ cholesterol
- **Immunosuppressants**

## NURSING INTERVENTIONS

**MONITOR**

- Daily weights
- Strict I &O
- Abdominal girth
- Vital signs
- Signs of infection
- Blood clots

**SKIN INTEGRITY**

- Monitor edema
- Assess for skin breakdown
  (↓ albumin increases risk of pressure ulcers)
- Q2 turning
- Elevate edematous extremities

**EDUCATION**

- ↓ sodium
- Moderate protein
- Limit fluids
- Avoid NSAIDs

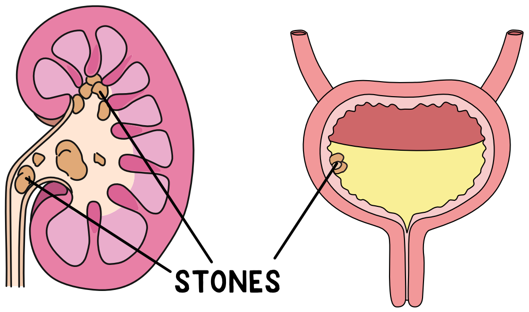
# RENAL CALCULI

## WHAT IS IT?

Hard deposits (stones) that form inside the urinary tract & kidneys

**CAN BE FOUND IN THE:**

① **KIDNEYS** (NEPHROLITHIASIS)
② **URETERS** (UROLITHIASIS)
③ **BLADDER**



## TYPES OF STONES

| CALCIUM OXALATE | URIC ACID | STRUVITE | CYSTINE |
|---|---|---|---|
| Forms due to high amounts of **calcium & oxalate** in urine | Forms due to high amounts of **uric acid** in urine | Forms from highly alkaline urine producing **ammonia** | Forms due to genetic disorder where cystine cannot get reabsorbed from renal tubules |
| **CAUSES:**<br>▸ Hypercalcemia<br>▸ Hyperparathyroidism<br>▸ ↑ oxalate diet<br>▸ IBD (malabsorption of fats) | **CAUSES:**<br>▸ ↑ purine & animal protein diet<br>▸ Gout<br>▸ Dehydration<br>▸ Type 2 diabetes | **CAUSES:**<br>Bacterial infection (chronic UTI's)<br>→ Bacteria increase the pH of urine, making it a favorable environment for ammonia to form | **CAUSES:**<br>Genetics |
| MOST COMMON | | | LEAST COMMON |

## SYMPTOMS

- → **Severe pain**
- → Oliguria
- → Hematuria
- → Dysuria
- → Fever
- → Nausea/ vomiting

**RENAL COLIC**

Dull, deep flank pain that indicates stone is in the **renal pelvis**

## DIAGNOSTICS

- → **KUB (X-RAY OF KIDNEYS, URETERS & BLADDER)**
- → **LABS:** BMP, CBC & uric acid
- → **URINALYISIS:** may show RBC, WBC, bacteria, & abnormal pH
- → **ULTRASOUND** or **CT SCAN**
- → **IV PYELOGRAM:** x-ray taken after admin of dye

## TREATMENT

### MEDICATIONS

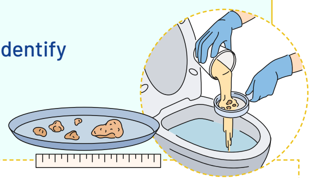
- → **NSAIDs:** ↓ inflammation & pain
- → **Opioid analgesics:** for severe pain

### PROCEDURES

- → **Lithotripsy:** non-invasive laser or shockwave used to break up stones
- → **Percutaneous Nephrolithotomy:** small incision made to surgically remove stone

## NURSING INTERVENTIONS

- → Encourage ambulation to mobilize stone
- → Enourage fluids to flush out stone
- → Strain all urine
  - → Stones are measured & sent to lab to identify type of stone for diet modifications
- → Monitor I & O



### EDUCATION

- ★ Adequate fluid intake to prevent dehydration (major risk factor)
- ★ Treat urinary tract infections promptly
- ★ Limit foods based on type of stone

**OXALATE FOODS**

- ▸ Dark leafy vegetables
- ▸ Beans
- ▸ Chocolate

**PURINE FOODS**

- ▸ Shellfish
- ▸ Organ meats
- ▸ Beer/ alcohol

# HEMODIALYSIS

## WHAT IS IT?

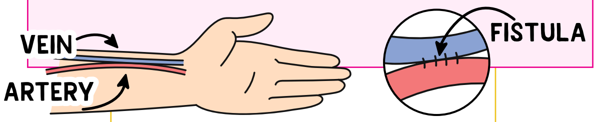
**HEMODIALYSIS** acts as an "artificial kidney" by removing waste & excess fluid from the body using a machine when kidneys are failing or not working efficiently

## TYPES OF ACCESS

### ARTERIOVENOUS (AV) FISTULA

Joining of vein & artery

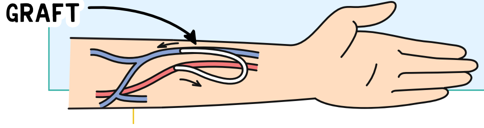
- → Permanent access
- → Maturation of fistula takes 8-12 weeks



### ARTERIOVENOUS (AV) GRAFT

Connection between vein and artery using tubing

- → Lasts 2-3 years
- → Maturation of graft takes 2-3 weeks



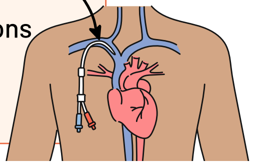
**HIGH RISK FOR:**

- ▸Thrombosis
- ▸Stenosis
- ▸Infection

### CENTRAL VENOUS CATHETER

IV catheter inserted into superior vena cava

- → Temporary vascular access only
- → Used in urgent and emergent situations



## ASSESSING FOR PATENCY

### (FISTULAS & GRAFTS)

REMEMBER "HEAR A BRUIT, FEEL A THRILL"

**BRUIT**

**Auscultated** over site: whooshing sound

**THRILL**

**Palpated** over site: will feel turbulent flow

IF EITHER IS ABSENT UPON ASSESSMENT NOTIFY MD IMMEDIATELY

## HEMODIALYSIS PROCESS

Dialyzer pulls blood outside the body

↓

Blood is pumped through the dialyzer (filter)

↓

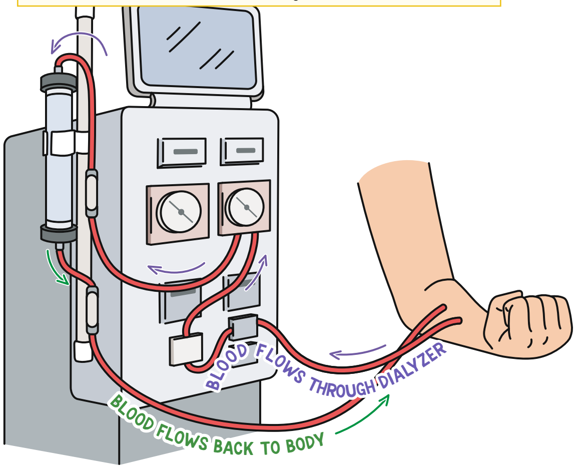
Blood is cleansed of toxins & waste products

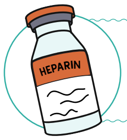
↓

Cleansed blood is returned to the body

**PROCESS IS REPEATED ABOUT 3X/ WEEK**

& each session lasts about 2-5 hours





**Heparin** is added to the blood during dialysis to ↓ risk of clotting

**COMPLICATION: DISEQUILIBRIUM SYNDROME**

Solutes are removed too quickly causing ↑ICP

**MONITOR FOR:**

- Restlessness & confusion
- Nausea/ vomiting
- Headache

## NURSING INTERVENTIONS

- → Hold meds prior to dialysis
  (many get dialyzed out; check with MD & pharmacy)
- → Monitor VS & EKG
- → Daily weights
  (weigh before & after dialysis)
- → Fluid restrictions
- → Monitor access site for infection

**NO MEDS THAT ↓ BP**

No diuretics or antihypertensives; risk for **hypotension** during dialysis

**ON ARM WITH ACCESS AVOID:**

| | |
|---|---|
| ✗ BP readings | ✗ Sleeping on arm |
| ✗ Blood draws | ✗ Carrying heavy bag |
| ✗ Tight clothing | ✗ Constricting jewelry |

# PERITONEAL DIALYSIS

## WHAT IS IT?

**PERITONEAL DIAYLSIS** is a type of dialysis that uses the peritoneum (lining of the stomach) that acts as a dialyzing membrane to filter blood

## PERITONEAL DIALYSIS PROCESS

Dialysate is infused into the peritoneum

↓

Catheter is clamped & dialysate dwells in the abdomen for a set time

↓

Dialysate filters the waste from the tiny blood vessels in peritoneum

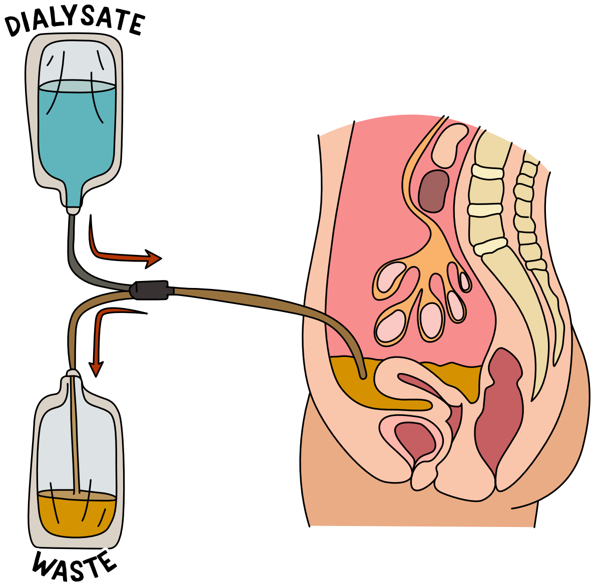
↓

Catheter is unclamped & waste products drain into sterile bag

↓

**PROCESS IS REPEATED MULTIPLE TIMES A DAY**

**COMPLETED 7 DAYS/ WEEK**
Dwell time based on MD order



## ACCESS

- Siliconized rubber catheter (Tenckhoff catheter) is inserted into the peritoneum
- Insertion site: 3-5 cm below umbilicus
- May take 1 month after insertion to heal/ mature before use

Peritoneal dialysis is done more frequently & often done at home in a non-sterile environement putting the patient at higher risk for **INFECTION**

## COMPLICATIONS

### RESPIRATORY DISTRESS

Due to rapid infusion or overfilling abdomen

- Crackles
- Dyspnea
- Tachypnea

### ★ PERITONITIS

Infection of the **peritoneum**

- Fever
- Tachycardia
- Cloudy drainage

## NURSING INTERVENTIONS

- Daily weights
  (weigh before & after dialysis)
- Warm dialysate solution before administering
- Always use sterile technique when accessing site
- Monitor color of drainage of outflow
- Monitor site for signs of infection

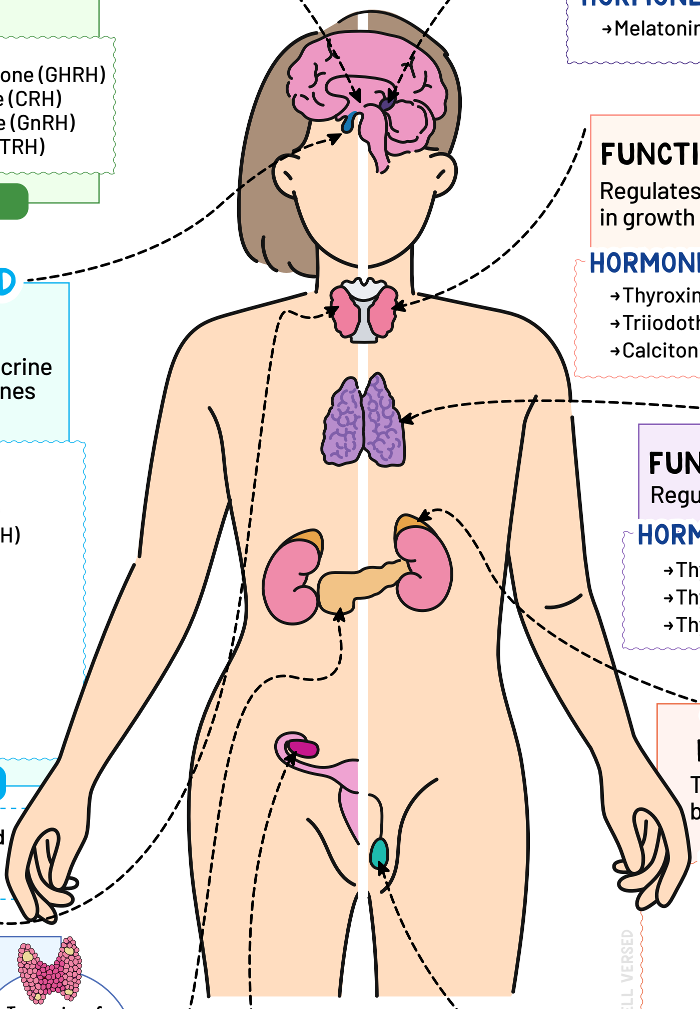
## EDUCATION

- Good hand hygiene before & after dialysis & anytime touching site
- Keep supplies in clean & dry place
- Clean & dry site daily
- Inspect site daily

# ENDOCRINE

# ENDOCRINE SYSTEM OVERVIEW

**THE ENDOCRINE SYSTEM** is made up of glands and organs that secrete hormones to maintain homeostasis throughout the body



## HYPOTHALAMUS

**FUNCTION:**

Maintains homeostasis and regulates body temperature, hunger, thirst & sleep

**HORMONES RELEASED:**

- →Growth hormone-releasing hormone (GHRH)
- →Corticotropin-releasing hormone (CRH)
- →Gonadotropin-releasing hormone (GnRH)
- →Thyrotropin-releasing hormone (TRH)

**CONTROL CENTER**

## PITUITARY GLAND

**FUNCTION:**

Controls functions of other endocrine glands through release of hormones

**HORMONES RELEASED:**

**ANTERIOR PITUITARY**

- →Thyroid-stimulating hormone (TSH)
- →Adrenocorticotropic hormone (ACTH)
- →Luteinizing hormone (LH)
- →Follicle-stimulating hormone (FSH)
- →Growth hormone (GH)
- →Prolactin

**POSTERIOR PITUITARY**

- →Oxytocin
- →Antidiuretic hormone (ADH)
  - aka **VASOPRESSIN**

**MASTER GLAND**

**NOTE:** Oxytocin & ADH are **produced** in the hypothalamus, but **stored** in the pituitary

## PARATHYROIDS

**FUNCTION:**

Regulates calcium balance

**HORMONES RELEASED:**

- →Parathyroid hormone (PTH)

Two pairs of parathyroids are located on the back of the thyroid gland

## PANCREAS

**FUNCTION:**

Regulates blood sugar

**HORMONES RELEASED:**

- →Glucagon (alpha cells)
- →Insulin (beta cells)

## PINEAL GLAND

**FUNCTION:**

Regulates sleep cycle

**HORMONES RELEASED:**

- →Melatonin

## THYROID

**FUNCTION:**

Regulates metabolism & plays key role in growth & development

**HORMONES RELEASED:**

- →Thyroxine (T4)
- →Triiodothyronine (T3)
- →Calcitonin

## THYMUS

**FUNCTION:**

Regulates immune system

**HORMONES RELEASED:**

- →Thymopoietin
- →Thymosin
- →Thymic Humoral Factor

## ADRENAL GLANDS

**FUNCTION:**

Triggers stress response & regulates bodily functions & metabolism

**HORMONES RELEASED:**

**ADRENAL MEDULLA**

- →Epinephrine
- →Norepinephrine

**ADRENAL CORTEX**

- →Cortisol (glucocorticoids)
- →Aldosterone (mineralcorticoids)
- →Androgens (sex hormones)

## OVARIES

**FUNCTION:**

Regulates female reproductive development & fertility

**HORMONES RELEASED:**

- →Estrogen
- →Progesterone

## TESTES

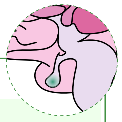
**FUNCTION:**

Regulates male fertility & sexual function

**HORMONES RELEASED:**

- →Testosterone

# HORMONE FUNCTIONS



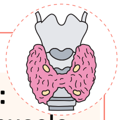
## HYPOTHALAMUS

**GROWTH HORMONE–RELEASING HORMONE:** Stimulates pituitary gland to release growth hormone (GH)

**CORTICOTROPIN–RELEASING HORMONE:** Stimulates pituitary gland to release ACTH

**GONADOTROPIN–RELEASING HORMONE:** Stimulates pituitary gland to release FSH & LH

**THYROTROPIN–RELEASING HORMONE:** Stimulates pituitary gland to release TSH



## THYROID

**TRIIODOTHYRONINE (T3) & THYROXINE (T4):** Metabolism, brain development, bone health, muscle control, heart and digestive function

**CALCITONIN:** Decreases serum calcium level by promoting calcium reabsorption to the bone

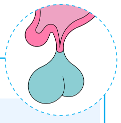
THINK CALCITONIN BRINGS CALCIUM INTO THE BONE

**HYPOTHYROIDISM: ↓T3 ↓T4 ↑TSH**

Positive Feedback Mechanism: Once thyroid hormones are low, the anterior pituitary gland is stimulated to produce **more** TSH

**HYPERTHYROIDISM: ↑T3 ↑T4 ↓TSH**

Negative Feedback Mechanism: Once thyroid hormones are high, anterior pituitary gland is downregulated to produce **less** TSH



## PITUITARY

**THYROID–STIMULATING HORMONE (TSH):** Stimulates thyroid gland to release T3 & T4

**ADRENOCORTICOTROPIC HORMONE (ACTH):** Stimulates adrenals to release cortisol

**LUTEINIZING HORMONE (LH):** Stimulates testes to produce testosterone & triggers release of egg from ovaries

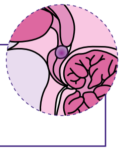
**FOLLICLE–STIMULATING HORMONE (FSH):** Stimulates testes to produce sperm and ovaries to produce eggs

**PROLACTIN:** Stimulates milk production & breast development

**GROWTH HORMONE (GH):** Stimulates growth of bones, muscles & tissues

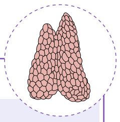
**OXYTOCIN:** Stimulates uterine contractions and breastmilk ejection (+ feeling of love & bonding)

**ANTIDIURETIC HORMONE (ADH):** Promotes reabsorption of water in the kidneys & vasoconstricts blood vessels



## PINEAL

**MELATONIN:** Regulates sleep-wake cycles

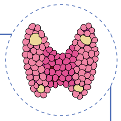


## THYMUS

**THYMOPOIETIN:** Helps produce T-cells

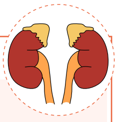
**THYMOSIN:** Helps maturewwww T-cells

**THYMIC HUMORAL FACTOR:** Regulates immune system response



## PARATHYROID

**PARATHYROID HORMONE (PTH):** Stimulates release of calcium from the bone



## ADRENAL GLANDS

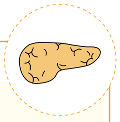
**CORTISOL (GLUCOCORTICOIDS):** ↑glucose

**ALDOSTERONE (MINERALCORTICOIDS):** ↑Na ↓K

**ANDROGENS:** ↑sex hormones

**EPINEPHRINE & NOREPINEPHRINE:** Catecholamines released for “fight or flight” response

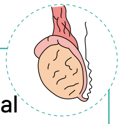
↑BP ↑HR ↑blood glucose



## PANCREAS

**INSULIN:** Moves glucose from blood into body tissues to be used for energy

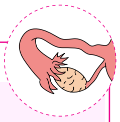
**GLUCAGON:** Stimulates liver to release glucose into the bloodstream to raise blood sugar



## TESTES

**TESTOSTERONE:** Regulates development of sexual development and function & sperm production

↑muscle mass ↑bone mass ↓fat mass



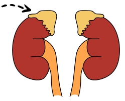
## OVARIES

**ESTROGEN:** Regulates menstrual cycle and female secondary sex characteristics

**PROGESTERONE:** Regulates menstrual cycle, maintains uterine lining, & supports fetal development

# ADDISON'S vs CUSHING'S

Two conditions that affect the ADRENAL CORTEX (OUTER LAYER OF ADRENAL GLANDS)



The adrenal glands sit on top of each kidney like a cap

## ADRENAL CORTEX FUNCTIONS:

REMEMBER THE 3 S'S

① Cortisol (corticosteroids) increases SUGAR
② Aldosterone (mineralcorticoids) increases SODIUM
③ Androgens increase SEX HORMONES

## ADDISON'S

**HYPOSECRETION** of adrenal cortex hormones
MAINLY ↓CORTISOL ↓ALDOSTERONE

Remember in ADDison's you need to ADD steroids

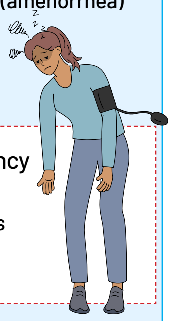
### CAUSES

- → Cancer or trauma
- → Infection of adrenals
- → Tuberculosis

### SYMPTOMS

EVERYTHING IS LOW (EXCEPT THE 2 P'S)

- **LOW** blood pressure
- **LOW** blood sugar
- **LOW** sodium (salt cravings)
- **LOW** weight (weight loss)
- **HIGH** potassium (↓ Na= ↑K)
- **HIGH** pigmentation (bronze skin)
- **LOW** mood & energy
- **LOW** hair (alopecia)
- **LOW** temp (cold intolerant)
- **LOW** periods (amenorrhea)



**COMPLICATION:** ADDISONIAN CRISIS

Life threatening severe acute adrenal insufficiency

**MONITOR FOR:**
- ▸Severe hypotension
- ▸Dysrhythmias (from ↑ K+)
- ▸Profound fatigue

**TREATMENT:**
- ▸IV glucocorticoids
- ▸IV fluids
- ▸Dextrose

### TREATMENT

→ Lifelong steroids

–SONES EX: Predisone & Hydrocortisone

WATCH FOR SIGNS OF TOO MANY STEROIDS
(WILL LEAD TO CUSHING'S)

→ Diet

▸ ↑ protein ↑ Na ↑ carbs ↓K+

## CUSHING'S

**HYPERSECRETION** of adrenal cortex hormones
MAINLY ↑CORTISOL

Remember in CUSHing's there's a CUSHION of steroids

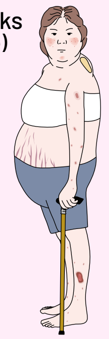
### CAUSES

- → Long-term steroid use
- → Tumors (adrenal or pituitary)
- → Adrenal hyperplasia (enlarged adrenal glands)

### SYMPTOMS

EVERYTHING IS HIGH & BIG (EXCEPT POTASSIUM)

- **HIGH** blood pressure
- **HIGH** blood sugar
- **HIGH** sodium
- **HIGH** weight (weight gain)
- **LOW** potassium (↑Na= ↓K+)
- **BIG** face (moon face)
- **BIG** belly (truncal obesity)
- **BIG** hair (hirsutism)
- **BIG** stretch marks (purple striae)



- →Buffalo hump (fat pad on back of neck)
- →Thin extremities
- →Easy bruising & petichiae
- →Slow wound healing (↑ risk of infection)
- →↑ risk of fractures
  (brittle bones/ osteoporosis from ↑steroid levels)

### TREATMENT

- → Slowly decrease steroids (never abruptly!)
- → **Adrenalectomy:** if cause is adrenal cortex
  (patient will require lifelong steroids!)
- → **Hypophysectomy:** if cause is pituitary tumor

# DIABETES MELLITUS

## GLUCOSE TRANSPORT

Pancreas produces insulin in response to glucose in the blood → Insulin travels in the bloodstream → Insulin acts like the key that unlocks the cell → Once the cell unlocks, glucose enters and is converted into energy

## TYPE 1

The pancreas makes little or no insulin

Since there is not enough insulin, cells don't get "unlocked" & glucose can't enter. Thus, glucose stays in the bloodstream causing ↑ blood sugar

### CAUSES

- → Genetics
- → Family history

Usually diagnosed in **childhood**

REMEMBER **CHILDHOOD** COMES **1ST** FOR **TYPE 1**

SYMPTOMS ARE **ABRUPT**

## TYPE 2

The pancreas makes insulin, but the body doesn't use it properly

Cells become resistant to insulin and glucose can't enter, causing glucose to get stuck in the blood

### CAUSES

- → Sedentary lifestyle
- → Hypertension
- → Hyperlipidemia
- → Obesity
- → Smoking
- → Family history

SYMPTOMS ARE **GRADUAL**

### SYMPTOMS

3 P'S

**POLYURIA** (↑ URINATION)
kidney's trying to excrete glucose via urination

**POLYDYPSIA** (↑ THIRST)
hypothalamus increasing thirst because blood is concentrated

**POLYPHAGIA** (↑ HUNGER)
due to limited entry of glucose into the cells

### TREATMENT

**LIFELONG INSULIN**
(only treatment option)

### TREATMENT

- → **Diet & exercise** (may be reversible!)
- → Oral antihyperglycemics (Metformin, Glipizide)
- → Insulin may be required in more severe cases

## DIAGNOSTICS

→ **FASTING BLOOD GLUCOSE:** no caloric intake ≥8 hours
NORMAL < 110 MG/DL

→ **GLUCOSE TOLERANCE TEST:** measures how well body processes sugar

STEPS:
① Test blood sugar
② Drink 75g glucose drink
③ Test blood sugar in 2 hours

→ **HBA1C:** measures average blood sugar over past 3 months
NORMAL: <5.7%
PREDIABETIC: 5.7–6.4%
DIABETIC: >6.5%

## SICK DAY RULES

- ★ Take normal dose of insulin & normal meds even if not eating
- ★ Check blood sugar & ketones every 3-4 hours
- ★ Substitute sick day foods if can't tolerate regular food (Ex: popsicles & jello)

### NOTIFY HCP IMMEDIATELY IF:

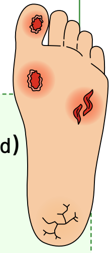
- ▶ Ketones are positive
- ▶ BG >240
- ▶ BG <70 after eating
- ▶ Unable to tolerate food or drink

## DIABETIC FOOT CARE

Diabetic patients may develop:

① **IMPAIRED SENSATION** (neuropathy)
② **IMPAIRED PERFUSION** (↑ glucose damages vessels)

Causes ↑ risk of injury & slow wound healing leading to **infection**



### EDUCATION

- ▶ Use lukewarm water, never hot! (test with hand)
- ▶ Inspect feet daily
- ▶ Ensure shoes fit well and not too tight
- ▶ Avoid crossing legs
- ▶ Trim toenails straight across
- ▶ Avoid walking barefoot
- ▶ Smoking cessation

## COMMON COMPLICATIONS:

**↓ perfusion can also lead to:**

- ▶ **NEPHROPATHY:** kidney damage (AKI or CKD)
- ▶ **RETINOPATHY:** eye damage (glaucoma, cataracts, blindness)
- ▶ **NEUROPATHY:** loss of sensation
- ▶ **HEART DISEASE/ STROKE** (damage & hardening of vessels)

# HYPOGLYCEMIA vs HYPERGLYCEMIA

Two complications due to dysregulation of **GLUCOSE**

| GLUCOSE FUNCTION: | INSULIN FUNCTION: | GLUCAGON FUNCTION: |
|---|---|---|
| Main source of energy for body's cells | Moves glucose into body's cells so it can be used for energy & tells liver to store glucose as gylcogen (stored up glucose for later use) | Tells liver to break down stored glycogen into glucose to be used as energy |

## HYPOGLYCEMIA

**LOW BLOOD SUGAR**

Body's using more glucose than it's producing

**<70 MG/ DL**

### CAUSES

- Exercise
- Alcohol consumption
- Excess insulin or skipping meals

### SYMPTOMS

**"COOL & CLAMMY NEED SOME CANDY"**

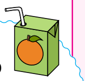
- Cool & clammy skin
- Pale
- Irritable & hungry
- Lethargy
- Confusion
- Slurred speech
- Shakiness
- Obtunded (can lead to coma!)

### TREATMENT

**15–15 RULE**

For concious patients **able to swallow:**

① Give patient 15g fast acting carbohydrate
② Wait 15 minutes & recheck blood glucose
③ Repeat steps 1 & 2 until glucose >70 mg/dL
(target range may vary per facility)



- Jello
- Orange juice
- Dextrose gel

For **unresponsive patients** **MEDICAL EMERGENCY**

① Give 25g Dextrose 50% or Glucagon IM/IV/SQ
② Wait 15 minutes & recheck blood glucose
③ Repeat steps 1 & 2 until glucose >70 mg/dL

**CALL MD IMMEDIATELY**

50% DEXTROSE

### EDUCATION

- Always carry glucagon kit & fast acting carb
- Check blood sugar levels regularly
- Eat a well balanced diet

**HYPOGLYCEMIA CAN MIMIC THE EFFECTS OF ALCOHOL!**

## HYPERGLYCEMIA

**HIGH BLOOD SUGAR**

Body is unable to use insulin properly

**>200 MG/ DL**

### CAUSES

- Missing insulin doses
- Illness, stress or infection
- Poor diet (lots of sweets, salt & fat)

### SYMPTOMS

**"IF SKIN IS DRY, SUGAR'S HIGH"**

3 P's

- **POLYURIA**
- **POLYDYPSIA**
- **POLYPHAGIA**
- Hot & dry skin
- Vision problems
- Fruity breath
- Numbness/ tingling
- Dry mouth

### TREATMENT

- Insulin
- Oral hypoglycemic agents
- Assess for signs of DKA or HHNS (*see DKA vs HHNS study sheet*)
- Diabetic diet

| AVOID | RECOMMENDED |
|---|---|
| ☒ Saturated fats | ✓ Whole grains |
| ☒ Trans fats | ✓ Fiber-rich foods |
| ☒ Refined sugars | ✓ Fruits & vegetables |
| ☒ High sodium | ✓ Low fat dairy |
| ☒ Skipping meals | ✓ Lean meats & protein |

### EDUCATION

- Medication & diet compliance
- Check blood sugar levels regularly
- Stress management
- Regular exercise & weight management

# DKA vs HHNS

Two complications of diabetes causing severely high levels of **GLUCOSE**

## DKA

### DIABETIC KETOACIDOSIS

**NO** insulin available to move glucose into cells

- Severe hyperglycemia
- Ketone production
- Metabolic acidosis

**MAINLY OCCURS IN TYPE 1 DIABETICS**

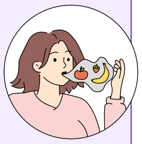
Absence of insulin leads to body breaking down fat for energy (no glucose in cells) leading to ketone production (acidic molecules)

### CAUSES

- → **Infection**/ illness
- → Surgery
- → Stress
- → Skipping insulin

### SYMPTOMS

★ **ABRUPT ONSET**



- → Dry membranes
- → BG 250-500+
- → Fruity breath (from acid build up)
- → Abdominal pain
- → Kussmaul respirations
  (attempt to blow off CO2)
- → Ketones in urine
- → Metabolic acidosis (<7.35)

### TREATMENT

- → **HYDRATION FIRST** (normal saline)
- → IV regular insulin drip
  - Only regular insulin can be given IV
  - Lower blood glucose **slowly**
  - Gradually transition to SQ
- → Hourly blood glucose checks
- → Admin potassium while on insulin gtt (based on protocol)
- → Monitor EKG rhythm & labs
  - Potassium
  - ABG (pH)
  - Ketones
  - Anion gap

## HHNS

### HYPERGLYCEMIC HYPEROSMOLAR NONKETOTIC SYNDROME

**VERY LITTLE** insulin available to move glucose into cells

- Severe hyperglycemia
- No ketone production
- Hyperosmolarity (very concentrated blood)

**MAINLY OCCURS IN TYPE 2 DIABETICS**

Insulin resistance leads to high amounts of glucose in the blood causing it to become thick & sticky

### CAUSES

- → **Infection**
- → Illness
- → Stress
- → Unmanaged diabetes
- → Renal impairment
- → Poor fluid intake

### SYMPTOMS

★ **GRADUAL ONSET**

- → **Severe dehydration**
- → BG 600+
- → Altered LOC
- → **3 P'S**
  - Polyuria
  - Polydypsia
  - Polyphagia

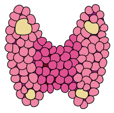
- ✗ NO ketones
- ✗ NO fruity breath
- ✗ NO kussmaul resp.
- ✗ NO acidosis
- ✗ NO abdominal pain

### TREATMENT

- → **HYDRATION FIRST** (normal saline)
- → IV regular insulin drip
  - Only regular insulin can be given IV
  - Lower blood glucose **slowly**
  - Gradually transition to SQ
- → Hourly blood glucose checks
- → Monitor hydration status
  - Strict I&O
  - Skin turgor
  - Blood pressure
  - Serum osmolality

# HYPOPARATHYROIDISM vs HYPERPARATHYROIDISM

Two conditions that affect the **PARATHYROID GLAND**



There are two pairs of parathyroid glands on the back of the thyroid

## PARATHYROID HORMONE FUNCTION:

Regulates calcium levels in the blood by:

① Stimulating bones to **release** calcium
② Directing kidneys to **conserve** calcium
③ Promoting intestines to **absorb** calcium

## HYPOPARATHYROIDISM

**HYPOSECRETION** of parathyroid hormone
**↓CALCIUM ↑PHOSPHOROUS**

### CAUSES

- Accidental removal/ damage during thyroidectomy
- Autoimmune disorders
- Hypomagnesimia
- Radiation exposure

### SYMPTOMS

**SYMPTOMS OF HYPOCALCEMIA**

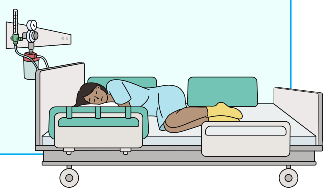
- Tetany
- Carpopedal spasm
- Numbness/tingling sensation
- (+) Chvostek's sign
- (+) Trousseau sign
- Dyspnea/wheezing (due to bronchoconstriction)
- Seizures

### TREATMENT

- IV calcium gluconate
- Vitamin D supplements (to absorb calcium)
- Phosphate binders (↓ phosphorous levels)

### NURSING INTERVENTIONS

- Monitor VS, airway & EKG
- Diet ↑calcium ↓phosphorous
- Seizure precautions
  - Padded siderails
  - Suction at bedside
  - Side lying & head elevated



## HYPERPARATHYROIDISM

**HYPERSECRETION** of parathyroid hormone
**↑CALCIUM ↓PHOSPHOROUS**

### CAUSES

**PRIMARY**
- Adenoma (non-malignant tumor) or malignant tumor

**SECONDARY**
- Kidney disease

### SYMPTOMS

**SYMPTOMS OF HYPERCALCEMIA**

- Bone fractures
- Bone deformities
- Skeletal pain
- Constipation
- Shortened QT interval
- Frequent urination (kidneys working harder)
- Kidney stones

### TREATMENT

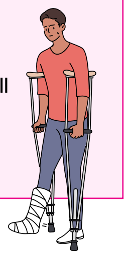
**PRIMARY**
- Parathyroidectomy (removal of parathyroid)

**SECONDARY**
- Calcitonin (↓ calcium)
- Diuretics (↑ excretion of calcium)
- Bisphosphonates (protect bones from losing calcium)

### NURSING INTERVENTIONS

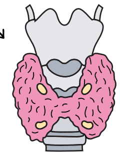
- IV fluids for hydration (↑ risk kidney stones)
- Diet ↓ calcium ↑ phosphorous
- Fall precautions

Patient is **HIGH RISK** for bone fractures if they fall



# HYPOTHYROIDISM vs HYPERTHYROIDISM

Two conditions that affect the **THYROID GLAND**



The thyroid is located at the base of the neck on the front of the trachea

## THYROID FUNCTIONS:

Regulates metabolism & growth and development by producing:

① T3 & T4 (thyroid hormone)
② Calcitonin (moves calcium into the bone)

**IODINE IS NEEDED TO CREATE THYROID HORMONES!**

## HYPOTHYROIDISM

**HYPOSECRETION** of thyroid hormones
↓T3 & T4 ↑TSH

### CAUSES

- → Hashimoto's (autoimmune disease where body attacks thyroid)
- → Low iodine intake
- → Pituitary tumor (pituitary produces TSH)
- → Thyroidectomy

### SYMPTOMS

**EVERYTHING IS LOW & SLOW**

LOW temperature (cold intolerance)
LOW heart rate (bradycardia)
LOW energy (lethargy & fatigue)
LOW hair (alopecia)
LOW libido (sex drive)
SLOW GI motility (constipation)
SLOW LOC (forgetfulness)
SLOW metabolism (weight gain)
SLOW menstruation (irregular/ missing periods)
SLOW skin moisture (dry skin)

**COMPLICATION: MYXEDEMA COMA**

**MEDICAL EMERGENCY** ⚠ Can lead to RESPIRATORY FAILURE

Severe deficiency of thyroid hormones
High risk after thyroidectomy or abrupt stop of levothyroxine

**SYMPTOMS**

- ▸ Hypothermia
- ▸ Bradycardia & hypotension
- ▸ Bradypnea (↓RR)
- ▸ Severely altered LOC (can lead to coma)

**PRIORITY**
MAINTAIN AIRWAY:
intubation set-up at bedside

### TREATMENT

**THYROID HORMONE REPLACEMENT**

- → Levothyroxine (leaves T3 & T4 in the body)
- → Will be on medication forever

Take in the morning **30-60 minutes before breakfast** at the same time everyday

## HYPERTHYROIDISM

**HYPERSECRETION** of thyroid hormones
↑T3 & T4 ↓TSH

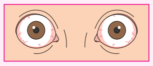
### CAUSES

- → Grave's disease (autoimmune disease where body stimulates thyroid)
- → Too much iodine intake
- → Excess thyroid replacement (Levothyroxine)
- → Toxic nodule goiter (nodules on thyroid stimulate T3/T4)

### SYMPTOMS

**EVERYTHING IS HIGH, BIG & HOT**

HIGH temperature (heat intolerance)
HIGH heart rate (tachycardia & dysrythmias)
HIGH energy (nervousness & tremors)
HIGH excitability (irritable & difficulty concentrating)
HIGH metabolism (weight loss)
HIGH GI motility (diarrhea)
HIGH blood pressure
BIG bulging eyes (exophthalmos)
BIG bulging thyroid (goiter)
HOT sweaty skin



**COMPLICATION: THYROID STORM**

**MEDICAL EMERGENCY** ⚠

Large amount of thyroid hormones release at once
High risk after thyroidectomy

**SYMPTOMS**

- ▸ Agitation and confusion
- ▸ High fever (>105 F)
- ▸ Tachycardia
- ▸ Hypertension

**TREATMENT**

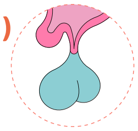
- ▸ Methimazole
- ▸ Corticosteroids (block T3/T4)
- ▸ Beta blockers
- ▸ Anti-pyretics

### TREATMENT

- → **Methimazole & PTU (Propylthiouracil):** Block synthesis of T3 & T4
- → **Potassium iodide:** shrinks thyroid (before removal)
- → **Beta blockers:** for hypertension & tachycardia
- → **Radioactive iodine:** destroys thyroid
- → **Thyroidectomy:** will require lifelong levothyroxine

# DIABETES INSIPIDUS vs SIADH

Two conditions due to dysregulation of **ANTIDIURETIC HORMONE (ADH)**
↳ AKA **VASOPRESSIN**



Stored in pituitary gland & released in response to low fluid volume

**ANTIDIURETIC HORMONE FUNCTION:**

Regulates fluid balance & blood pressure by:

① Stimulating water retention in kidneys
② Stimulating vasoconstriction in blood vessels

## DI

**D**IABETES **I**NSIPIDUS

↓ **HYPO**SECRETION of antidiuretic hormone

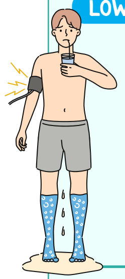
**LOSING WATER**

### CAUSES

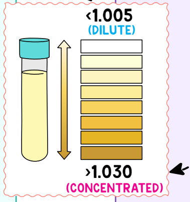
- → Brain trauma/ surgery
- → Damage to hypothalamus
- → Tumor
- → CNS infection (meningitis, encephalitis)

### SYMPTOMS

- **HIGH** urine output (up to 20L/day!)
- **HIGH** blood osmolality (blood is thick & concentrated)
- **HIGH** serum sodium (145+)
- **LOW** urine specific gravity (<1.005)
- **LOW** urine osmolality



- → Dry mucous membranes
- → Decreased skin turgor
- → Hypotension
- → Polydypsia (excessive thirst)



### TREATMENT

- → Desmo**PRESSIN** (DDAVP) = form of Vaso**PRESSIN**
  ↳ Causes body to retain water & ↓ urine output
- → **HYPO**tonic IV fluids

### NURSING INTERVENTIONS

- → Strict I&O
- → Daily weights
- → Monitor VS & EKG
- → Monitor electrolytes & urine specific gravity
- → Safety precautions
  (frequent bathroom trips= ↑ risk of falls)

## SIADH

**S**YNDROME OF **I**NAPPROPRIATE **A**NTIDIURETIC **H**ORMONE

↑ **HYPER**SECRETION of antidiuretic hormone

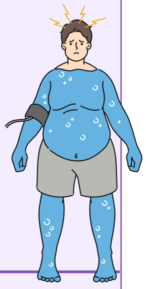
**RETAINING WATER**

### CAUSES

- → Small cell lung cancer
- → Brain trauma/ surgery
- → Infection (meningitis, sepsis)
- → Tumor

### SYMPTOMS

- **LOW** urine output
- **LOW** blood osmolality
- **LOW** serum sodium (<135)
- **HIGH** urine specific gravity (>1.030)
- **HIGH** urine osmolality



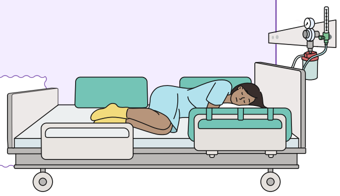
- → Weight gain (from excess fluid)
- → Confusion & irritability
- → Hypertension
- → Seizures

### TREATMENT

- → **Loop diuretics:** ↑ urine output
- → **Vasopressin antagonists** (block vasopressin)
- → **HYPER**tonic saline

### NURSING INTERVENTIONS

- → Strict I & O
- → Daily weights
- → Fluid restriction (monitor for fluid overload)
- → Neuro checks
- → Seizure precautions
  ↳
  - ‣ Padded siderails
  - ‣ Suction and O2 ready
  - ‣ Bed in low position



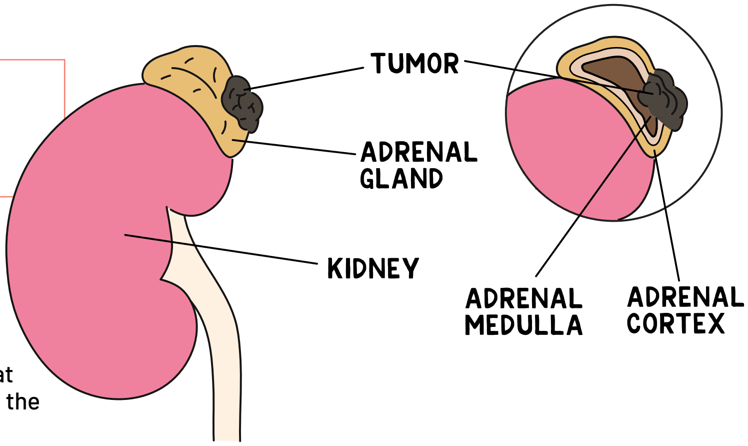
# PHEOCHROMOCYTOMA

## WHAT IS IT?

Rare tumor on the **adrenal medulla** located on the adrenal gland

The adrenal medulla contains **chromaffin cells** which secrete
**EPINEPHRINE & NOREPINEPHRINE**

**Epinephrine & norepinephrine** are catecholamines that stimulate the sympathetic nervous system to produce the **FIGHT OR FLIGHT RESPONSE**



## RISK FACTORS

Cause is **UNKNOWN**

→ Genetic defects & family history

## SIGN & SYMPTOMS

THINK SYMPTOMS DUE TO **EXTREME STRESS**

**HIGH** temperature
- →heat intolerance
- →excessive sweating

**HIGH** metabolic rate
- →increased appetite
- →weight loss

**HIGH** blood pressure
- →facial flushing
- →sudden & severe headaches

**HIGH** heart rate

**HIGH** blood sugar

**HIGH** anxiety

## TREATMENT

→ **Adrenalectomy:** Removal of adrenal gland
(Will require hormone replacement post-op)

→ **Antihypertensives**

## DIAGNOSTICS

→ **24 HOUR URINE TEST:** test for byproducts from breakdown of epinephrine & norepinephrine
↳ Metanephrine & vanillylmandelic acid

→ **CT SCAN/ MRI:** assess for tumors

→ **CLONIDINE SUPPRESSION TEST**

① Take blood sample for epinephrine & norepinephrine
② Administer clonidine
③ Reassess levels of epinephrine & norepinephrine

NO CHANGE IN LEVELS INDICATES PHEOCHROMOCYTOMA

## COMPLICATION: HYPERTENSIVE CRISIS

**MEDICAL EMERGENCY ⚠**

BP > 180/120

Excess amounts of norepinephrine & epinephrine cause dangerously high blood pressure

↳ Can lead to stroke, MI, or renal failure if not treated promptly!

| SYMPTOMS | TREATMENT |
|---|---|
| ▸ Severe headache | ▸ Labetalol |
| ▸ Vision changes | ▸ Nitrates |
| ▸ Shortness of breath | ▸ Decrease environmental stimuli |

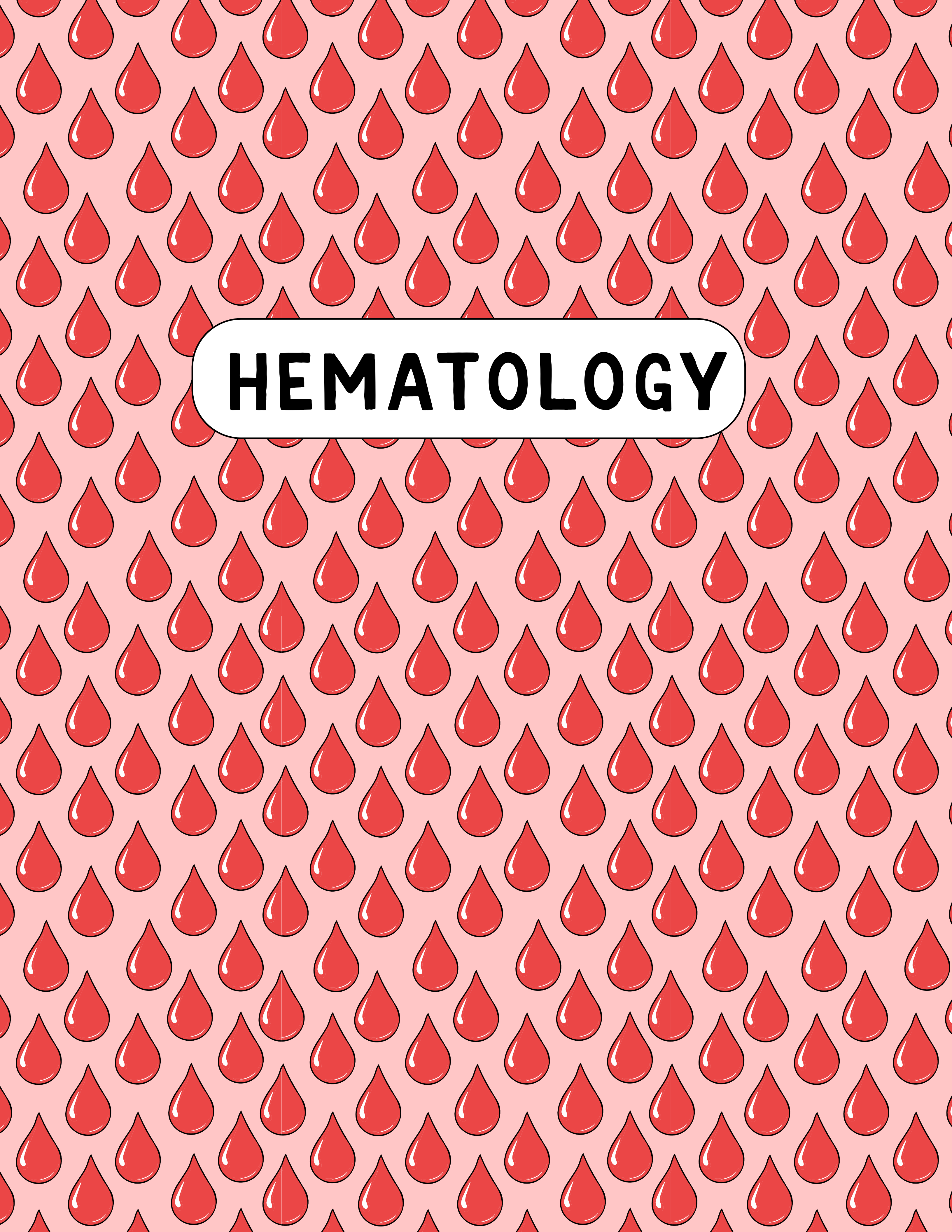
## NURSING INTERVENTIONS

- → Monitor VS & EKG
- → Monitor blood glucose
- → ↑ calorie diet (↑ metabolism)
- → Provide cool & calm environment (↓ stimulation)

**AVOID TRIGGERS**

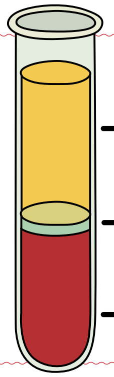
- 🚫 Emotional stress
- 🚫 Surgery or injury
- 🚫 Medications (MAOIs)
- 🚫 Stimulants (caffeine, smoking)
- 🚫 Tyramine rich foods
  - ▸ Fermented foods
  - ▸ Aged cheeses
  - ▸ Wine
  - ▸ Smoked/ dried meat
  - ▸ Chocolate
  - ▸ Sauerkraut

# HEMATOLOGY



# HEMATOLOGY OVERVIEW

## COMPONENTS OF BLOOD



**PLASMA**
55% OF BLOOD VOLUME

**BUFFY COAT** (WBC & PLATELETS)
1% OF BLOOD VOLUME

**RBC**
45% OF BLOOD VOLUME

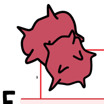
## FUNCTIONS

**PLASMA**
Carries minerals, immunoglobulins, proteins

**WBC**
Fight & protect against pathogens

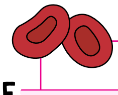
**PLATELETS**
Prevent & stop bleeding

**RBC**
Carry 02 & remove CO2



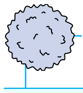
## RED BLOOD CELLS (AKA ERYTHROCYTES)

| TYPE | FUNCTION | NORMAL RANGE |
|---|---|---|
| **RBC** | Amount of cells in blood | **MALE:** 4.7-6.1 /uL<br>**FEMALE:** 4.2-5.4 /uL |
| **HEMATOCRIT** | Percent of RBC in blood | **MALE:** 39-54 g/ dL<br>**FEMALE:** 36-48 g/ dL |
| **HEMOGLOBIN** | Protein in RBC that carry 02 & remove CO2 | **MALE:** 13-18 g/d L<br>**FEMALE:** 12-16 g/dL |



## PLATELETS (AKA THROMBOCYTES)

| TYPE | FUNCTION | NORMAL RANGE |
|---|---|---|
| **APTT**<br>(Activated Partial Thromboplastin Time) | →Tests how fast blood clots<br>→Used to measure effectiveness of Heparin | **NORMAL RANGE:** 30-40 seconds<br>**ON HEPARIN:** 47-70 seconds |
| **PT**<br>(Prothrombin Time) | →Tests how fast blood clots<br>→Used to calculate INR level | 10-13 seconds |
| **INR**<br>(International Normalized Ratio) | →Normalized ratio of PT<br>→Used to measure effectiveness of Warfarin | **NORMAL RANGE:** <1<br>**ON WARFARIN:** 2-3 |
| **D-DIMER** | →Protein fragment in blood when a blood clot dissolves<br>→Commonly used as diagnostic for clot disorders | <0.5 mcg/ mL |



## WHITE BLOOD CELLS (AKA LEUKOCYTES)

| TYPE | FUNCTION | NORMAL RANGE |
|---|---|---|
| **WBC** | Amount of cells in blood | 4,500-11,000 / uL |
| **EOSINOPHILS** | Fight inflammation & parasites | 1-5 % |
| **BASOPHILS** | Control inflammatory & allergic response | 0.1- 2% |
| **NEUTROPHILS** | First responder of WBC's | 40-70% |
| **LYMPHOCYTES** | Recognize antigens & fight viral infections | 20-40% |
| **MONOCYTES** | Engulf & destroy invaders | 4-13% |

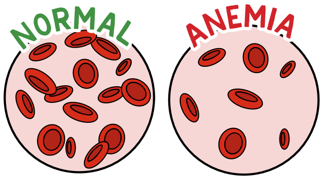
# TYPES OF ANEMIA

## WHAT IS IT?

Deficiency in one or more of the major red blood cell measurements (RBC, HGB, HCT, MCV)

## NORMAL HGB LEVELS:

**MALE:** 13–18 G/DL
**FEMALE:** 12–16 G/DL



**ANEMIA** has many different causes and can be classified in different ways. Depending on the type, specific symptoms may be present along with the baseline symptoms of anemia due to **low blood count**

## GENERAL ANEMIA SYMPTOMS:

- Fatigue & easily tired
- Pallor
- Cold hands & feet
- Tachycardia
- Shortness of breath
- Weakness

## IRON DEFICIENCY

Body does not have enough iron which is needed to make hemoglobin

### CAUSES

- → ↓ iron intake
- → ↓ absorption
  - GI surgery
  - Celiac disease
  - Medications ( PPI's & H2 Blockers)
- → Bleeding
  - Heavy menstruation
  - GI bleed
  - Ulcers

### UNIQUE SYMPTOMS

- → PICA
  - Abnormal cravings for non-food items with no nutritional value (clay, ice, dirt)
- → Smooth & glossy tongue

### DIAGNOSTICS

- → ↓ hemoglobin
- → ↓ hematocrit
- → ↓ iron level

### TREATMENT

- → Iron supplementation
  - **SIDE EFFECTS:** Black stools & constipation
- → Vitamin C (↑ iron absorption)
- → Blood transfusions
- → Iron rich foods
  - Egg Yolks
  - Apricots
  - Leafy Greens
  - Tofu
  - Potatoes
  - Poultry

## APLASTIC

Bone marrow cannot make enough new blood cells causing low blood count levels

### CAUSES

- → Autoimmune (cells attack bone marrow)
- → Genetics
- → Exposure to radiation
- → Viral infections (HIV)
- → Medications
  - Anticonvulsants
  - Methimazole
  - Sulfonimides

### UNIQUE SYMPTOMS

- → Petechiae
- → Easily bruised
- → Bleeding gums
- → Recurrent infections

### DIAGNOSTICS

- → **CBC** (will show pancytopenia)
  - ANC <500
  - Platelet <20,000
  - ↓ hemoglobin ↓ hematocrit
- → **Bone marrow biopsy** (will show ↓ stem cells & ↑ fat)

### TREATMENT

- → **Epoetin injection:** stimulates bone marrow to produce RBC
- → Blood transfusions
- → Bone marrow transplant

## MEGALOBLASTIC

Red blood cells are big and underdeveloped

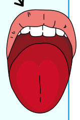
Usually due to **B12** or **FOLIC ACID DEFICIENCY**

### CAUSES

- → Autoimmune (Body doesn't produce **intrinsic factor** in stomach which helps absorb B12)
- → GI disorder or surgery
- → ↓ B12 or folic acid intake

### UNIQUE SYMPTOMS

- → GI upset
- → Weight loss
- → Taste & smell changes
- → **Beefy red tongue**
- → Confusion



### DIAGNOSTICS

- → ↓ HGB ↓ HCT
- → ↓ B12 or ↓ folate
- → + intrinsic factor antibody

### TREATMENT

- → Vitamin supplementation
- → B12 injections (cannot be taken PO due to ↓ intrinsic factor)
- → B12 rich foods
  - Meat
  - Fish
  - Poultry
  - Eggs & dairy
- → Folate rich foods
  - Dark leafy greens
  - Nuts
  - Beans
  - Meat & poultry

## HEMOLYTIC

Blood cells are destroyed faster than they are made

### CAUSES

- → Bacterial & viral infections
- → Blood transfusion reaction
- → Mechanical heart valves
- → Autoimmune disease
- → Medications (Cephalosporins)

### UNIQUE SYMPTOMS

- → Enlarged spleen or liver
- → Dark, blood tinged urine (from hemolysis)
- → Jaundice
- → Fever

### DIAGNOSTICS

- →↑ reticulocyte count (immature RBC's)
- →**Coomb's Test:** tests for antibodies that destroy RBC's
- →↓ haptoglobin
- →↑ LFT & bilirubin

### TREATMENT

- → Blood transfusion
- → Plasmapheresis
- → Bone marrow transplant
- → Immunosuppressants
- → Splenectomy
- → Immunoglobulin

# SICKLE CELL ANEMIA

## WHAT IS IT?

Type of hemolytic anemia that causes hemoglobin to change into a "sickle" shape, that block blood vessels & die faster than normal RBC's can be produced

Due to abnormal **HEMOGLOBIN S PROTEIN** in RBC

## CAUSES

**GENETICS:** inheritance of sickle cell gene
→ must inherit gene from **both** parents

★ **MOST COMMON IN AFRICAN AMERICANS**

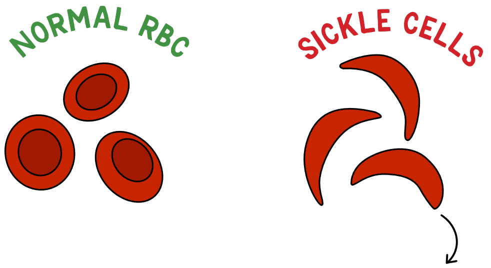
## SYMPTOMS

- Severe pain
  (pointy sickle cells hitting inside of blood vessels)
- Dactylitis: swelling of hands & feet
  (sickle cells blocking blood flow)
- Frequent infections
  (sickle cells clog vessels in spleen)
- Vision issues
  (sickle cells clog vessels in eyes)
- Gall stones & jaundice
  (sickle cells clog vessels in liver)
- General anemia symptoms
  - Fatigue
  - Pallor
  - Tachycardia
  - Shortness of breath
- **ACUTE CHEST SYNDROME:** Perfusion to lungs gets blocked due to sickle cells or infection
  - Chest pain
  - Hypoxia
  - Cough

## TREATMENT

**NO CURE: GOAL IS SYMPTOM MANAGEMENT**

- **Pain management:** routine opioids & analgesics while in crisis
- IV fluids & encourage hydration (stop clumping of RBC's)
- Blood transfusions
- Stem cell transplant
- Supplemental oxygen
- Antibiotics (if triggered from infection)



Causes RBC to have crescent shape & become sticky
↓
RBC stick together & get stuck in blood vessels causing ↓**TISSUE PERFUSION**

## TYPES OF SICKLE CELL CRISIS

### VASO-OCCLUSIVE

RBC's stick & clump together, blocking blood flow **(very painful)**
→ **CAN LEAD TO:** Stroke, AKI, leg ulcers

**MOST COMMON**

### HYPERHEMOLYTIC

Destruction of RBC's at rapid rate causes excess bilirubin
→ **CAN LEAD TO:** Gallstones, jaundice, organ failure

### APLASTIC

RBC's not being made because bone marrow can't keep up
→ **CAN LEAD TO:** Severe hypoxia

### SEQUESTRATION

Spleen becomes congested with RBC's & can't function properly
→ **CAN LEAD TO:** Infection

## SICKLE CELL CRISIS TRIGGERS

- Surgery/trauma
- Mental or emotional stress
- Infection
- Vigorous exercise
- Dehydration
- Extreme temperatures (hot or cold)

## EDUCATION

- Good hand hygiene
- Keep vaccines up to date
- Avoid extreme weather
- Avoid high altitudes
- Stress management
- Smoking cessation
- Stay hydrated
- Avoid strenuous activity and allow self adequate rest periods
- Healthy diet
- Avoid being around sick people
- Regular eye exams
- Get adequate sleep

# DIC (DISSEMINATED INTRAVASCULAR COAGULATION)

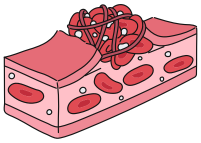
## WHAT IS IT?

Coagulation disorder due to overstimulation of **proteins that control coagulation (clotting)**

### CLOTTING FACTORS

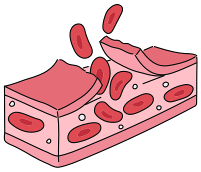
| FACTOR | FUNCTION |
|---|---|
| **THROMBIN:** | Facilitates clotting by initiating conversion of fibrinogen to fibrin |
| **FIBRINOGEN:** | Protein produced in liver that is converted into fibrin during blood clot formation |
| **FIBRIN:** | End product of clotting cascade; forms tight mesh around platelet plug |

ABNORMAL **CLOTTING**



&

ABNORMAL **BLEEDING**



BOTH OCCURING AT THE **SAME TIME**

In **DIC**, thrombin is uncontrollably converting fibrinogen to fibrin causing clotting

↓

Abnormal clotting leads to increased consumption of clotting factors and platelets, leading to **bleeding**

## CAUSES

NOT A DISEASE

Occurs in response to disease that initiates uncontrolled action of clotting cascade

- Sepsis
- Trauma
- Cancer
- Obstetric complications
- Allergic reaction
- Blood transfusion reaction
- Organ transplant rejection
- Toxin exposure

## CLOTTING CASCADE

Initial injury

↓

Local platelets activated to form temporary plug at site to limit bleeding

↓

Platelet plug attracts clotting factors & triggers coagulation cascade

↓

Once clot formed, thrombin initiates negative feedback loop to break down clot to avoid excess clotting (fibrinolysis)

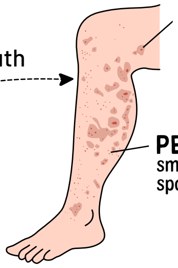
## SYMPTOMS

### FROM BLEEDING:

- Bleeding from nose, gums, mouth
- Bloody stool or urine
- Petechiae or purpura
- Hypotension

### FROM CLOTTING:

- DVT
- Stroke
- Myocardial infarction
- Peripheral cyanosis



**PURPURA**
large, bruise-like spots spots >4 mm

**PETECHIAE**
small, non-blanching spots spots <3 mm

## DIAGNOSTICS

**→ LABS**

- ↓ PLT
- ↓ fibrinogen
- ↑ PT & aPTT (prolonged clotting time)
- ↑ D-dimer (indicates clot present)

## TREATMENT

- **IV fluids:** ↑ blood volume
- Blood transfusions
  - Platelets to ↓ bleeding
  - Fresh frozen plasma to ↑ clotting
  - Cryoprecipitate ↑ fibrinogen
- **Heparin infusion:** ↓ clotting
- **Vasopressors:** vasoconstrictors to maintain blood pressure

## NURSING INTERVENTIONS

- Administer oxygen as needed
- Bleeding precautions
  - Avoid unnecessary needle sticks
  - Electric razor only
  - Fall risk

### MONITOR:

- VS & EKG
- Strict I & O (↓ output may be sign of shock)
- CBC, electrolytes & clotting factors
- Signs of bleeding
  - Hematuria
  - Bloody secretions when suctioning
  - Oozing IV sites
  - Bruising

# DEEP VEIN THROMBOSIS

## WHAT IS IT?

A type of venous thromboembolism in which a blood clot forms within a **deep vein**

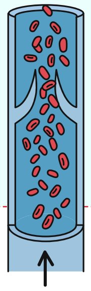
## MOST AT RISK FOR DEVELOPING DVT:

**IN CALVES**
- Peroneal vein
- Posterior tibial vein

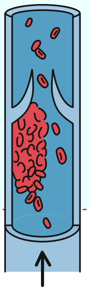
**IN THIGHS**
- Popliteal vein
- Superficial femoral vein

## PATHO

### 1 UNDERLYING CAUSE (FROM VIRCHOW'S TRIAD)

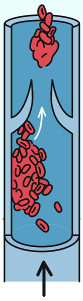


### 2 PLATELETS COLLECT AT THE CUSPS OF THE VEIN'S VALVE



Clotting factors create fibrin
↓
Fibrins cause the WBC, RBC, & platelets to stick together in the vein
↓
Clot forms & continues to grow

### 3 CLOT MAY BREAK OFF & TURN INTO A PE



DVT's in lower extremities have a higher chance of breaking off and turning into a **PULMONARY EMBOLISM**

## CAUSES: VIRCHOW'S TRIAD

### HYPERCOAGULABILITY

Increased tendency for clotting

- Infection/ sepsis
- Dehydration
- Heparin Induced Thrombocytopenia
- Oral contraceptives

### VENOUS STASIS

Blood **STA**ying in one spot

- Immobilization (sedentary, airplane travel)
- Recent surgery
- Peripheral vascular disease
- Pregnancy

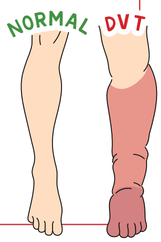
### VESSEL DAMAGE

Damage to blood vessel walls

- Central lines & IV lines
- IV drug use
- Venipuncture
- Trauma/ injury

## SYMPTOMS

- **Localized:**
  - Swelling
  - Warmth
  - Tenderness
  - Erythema or pallor
- **Positive Homan's Sign** (pain upon dorsiflexing foot)
- Low grade fever



## TREATMENT

DOES NOT DISSOLVE CLOT

- **Anticoagulation:** prevents clot growth
  - Heparin (fast-acting) MONITOR APTT
  - Warfarin (takes 5 days for effects) MONITOR INR
- **Thrombolytics:** dissolves clot
  - tPA (Alteplase) MONITOR FOR BLEEDING
- **IVC filter:** filter inserted in IVC to catch clots and prevent from going to heart & lungs

## DIAGNOSTICS

- **ULTRASOUND**
- **D-DIMER** NORMAL < 0.5
  - **Not** definitive & does not specify where clot is; if elevated will need ultrasound for follow-up

## NURSING INTERVENTIONS

- Bed rest
- Neurovascular checks
- Elevate affected extremity
- Monitor leg circumference
- Monitor for signs of PE
  - Sudden shortness of breath
  - ↑ HR ↑RR
  - Hypoxia

### PREVENTION

- SCD's
- Compression stockings
- Early ambulation
- ROM exercises to unaffected limbs

### DURING ACTIVE DVT

✗ Do not apply SCD's
✗ Do not rub or massage area

**CAN DISLODGE THE CLOT!**

# HEMOPHILIA

## WHAT IS IT?

Inherited disorder that causes the blood to not clot properly

Due to lack of clotting proteins:

① **FACTOR VIII (HEMOPHILIA A)** from F8 gene mutation
② **FACTOR IX (HEMOPHILIA B)** from F9 gene mutation
③ **FACTOR XI (HEMOPHILIA C)** from F11 gene mutation

## CAUSES

### GENETICS

→ **Hemophilia A & B are X-linked recessive**
  ↳ affect mainly males & women are *carriers*

→ **Hemophilia C is autosomal recessive**
  ↳ affects both males & females

Can also be acquired due to random **GENETIC MUTATION**

## SYMPTOMS

→ **Excessive bleeding:**
  - Large or deep bruises
  - Hematuria
  - Nosebleeds
  - Bleeding after dental work
  - Heavy menstrual bleeding
  - Excess bleeding from cuts
  - Joint pain & decreased ROM (bleeding in joint space)

**COMPLICATION: INTRACRANIAL HEMORRHAGE**

Bleeding inside skull that can cause **rapid increase in intracranial pressure**

- Headaches
- Change in LOC
- Vision changes
- Slurred speech

**MEDICAL EMERGENCY**

## TREATMENT

→ **Replace deficient clotting factors**

→ **Blood transfusions:** for excessive bleeding to replace blood volume

→ DDAVP: promote production of clotting factors (for mild hemophilia only)

→ **Antifibrinolytics:** promote clotting by slowing fibrinolysis process

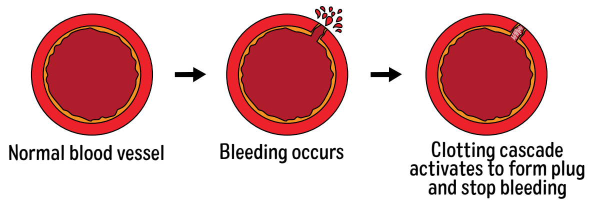
### AFFECTS THE INTRINSIC PATHWAY

There is an instrinsic, extrinsic & common pathway that activates certain factors in the **clotting cascade**

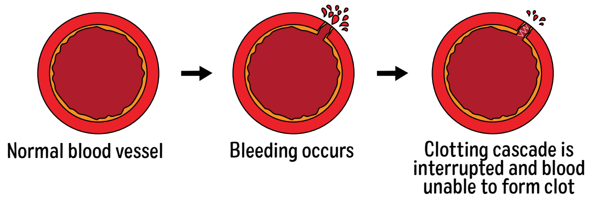
Factors within the **INTRINSIC PATHWAY** are missing in hemophilia

Leads to disruption in clotting cascade and
**PROLONGED BLEEDING TIMES**

**NORMAL CLOTTING**


Normal blood vessel
Bleeding occurs
Clotting cascade activates to form plug and stop bleeding

**HEMOPHILIA**


Normal blood vessel
Bleeding occurs
Clotting cascade is interrupted and blood unable to form clot

## DIAGNOSTICS

→ **LABS**
  - **NORMAL** platelets
  - **NORMAL** PT (extrinsic pathway not affected)
  - ↑ aPTT

→ **CHROMOGENIC ASSAY:** measures clotting factor activity

## NURSING INTERVENTIONS

→ Monitor VS & labs (coags & CBC)
→ Monitor skin for bruising
→ Monitor urine & stool for bleeding
→ Monitor and manage pain
→ **Bleeding precautions**
  - Avoid unnecessary blood draws/ finger sticks
  - Electric razor and soft toothbrush
  - Fall risk & encourage use of assistive devices

### EDUCATION

★ Avoid high impact sports or activites
★ Give children only soft non-edged toys
★ Use helmets and padding for physical activites
★ Regular ROM exercises to maintain mobility

# THROMBOCYTOPENIA

## WHAT IS IT?

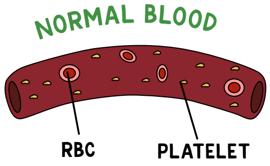
Disorder that causes increased risk of bleeding due to abnormally low **platelets**

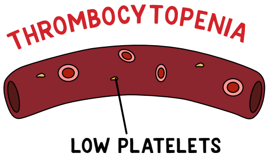
**NORMAL RANGE: 150,000-450,000 / UL**

Formed in the **bone marrow** & 50% are stored in the **spleen**

## PLATELET FUNCTION:

Clot formation to stop bleeding





Leads to **INCREASED RISK OF BLEEDING**

## CAUSES

### IMPAIRED PLATELET PRODUCTION

- Viral infections (HIV or Hepatitis)
- Folate & B12 deficiencies
- Aplastic anemia (bone marrow not producing RBC's)

### INCREASED PLATELET DESTRUCTION

- DIC
- Heparin Induced Thrombocytopenia (immune response to heparin)

### IMPAIRED PLATELET DISTRIBUTION

- Liver cirrhosis (alcohol abuse)
- Splenomegaly

## SYMPTOMS

- Easily bruising
- Petechiae or purpura
- Bleeding from gums, mouth, nose
- Oozing from IV sites
- Weakness, dizziness, fatigue
- Prolonged bleeding
- Heavy menstrual flow
- Hematuria or bloody stool

## IMMUNE THROMBOCYTOPENIC PURPURA

Type of thrombocytopenia due to body developing **antibodies** that attack own platelets

### RISK FACTORS

- More common in women
- Children after viral illness
- Autoimmune disease (rheumatoid arthritis, lupus)
- Viral infections (hepatitis)
- Medications (antivirals, antibiotics)

will have positive **PLATELET ANTIBODIES**

## DIAGNOSTICS

- **PLATELET COUNT: <150,000**
  - 100,000-150,000: MILD
  - 50,000-100,000: MODERATE
  - <50,000: SEVERE

**PT/ APTT** may be **NORMAL**

- **BONE MARROW BIOPSY:** may show abnormal platelet production or aplastic anemia (↓ RBC production)

## TREATMENT

**FIND & TREAT UNDERLYING CAUSE!**

- Platelet transfusion
- D/C of antithrombotics
- Bone marrow transplant
- Splenectomy (if unresponsive to other treatments)

### IMMUNE THROMBOCYTOPENIC PURPURA

- **Glucocorticoids:** ↑ platelet production
- **IV immunoglobulin:** slows platelet destruction

## NURSING INTERVENTIONS

- Monitor VS & labs
- Monitor skin for bruising
- Monitor urine & stool for bleeding
- **Bleeding precautions**
  - Avoid unnecessary blood draws/ finger sticks
  - Use smaller needle size when possible
  - Fall risk & encourage use of assistive devices
  - No rectal temps
  - Avoid frequent blood pressures if possible

## EDUCATION

- Avoid high impact activites
- No aspirin or NSAID's
- Avoid forcefully blowing nose
- Soft toothbrush
- Avoid alcohol
- Eat more leafy greens (Vitamin K)
- Avoid straining during BM's
- Avoid tampons & monitor menstruation

# IMMUNE

# IMMUNE SYSTEM OVERVIEW

**THE IMMUNE SYSTEM** is made up of organs, blood cells, antibodies and chemicals that protect the body and it's cells from foreign invaders that cause infection

## THYMUS

- →Aids in development of T Cells
- →Development of adaptive immunity

## SPLEEN

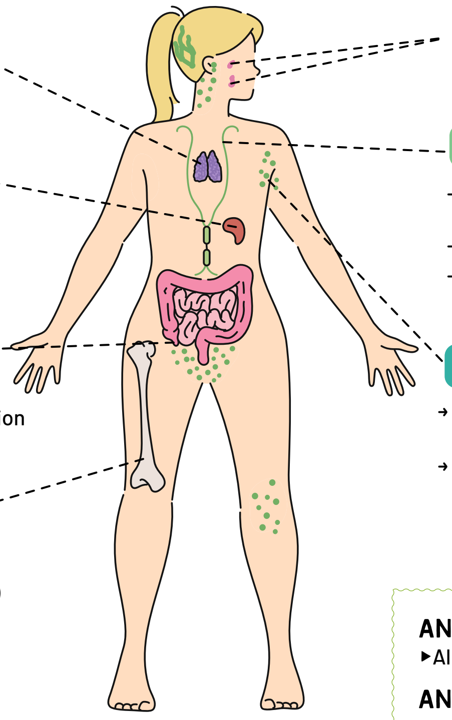
- →Stores blood for future use
- →Detects & filters old and damaged cells

## APPENDIX

- →Stores "good" bacteria for GI tract
- →Contains lymphoid cells that help prevent infection

## BONE MARROW

- →Produces red blood cells (carry oxygen to tissues)
- →Produces platelets (control bleeding)
- →Produces white blood cells (fight infection)



## TONSILS

Filter out germs from the mouth & throat to prevent them from entering the body

## LYMPHATIC VESSELS

- → Transport & filter lymphatic fluid before it re-enters circulation
- → Produce & release lymphocytes
- → Maintains fluid balance

## LYMPH NODES

- → Filters substances traveling in the lymphatic fluid
- → Contains lymphocytes that fight infection and disease

## ANTIGEN VS. ANTIBODY

**ANTIGEN:** Triggers **immune response**

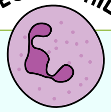
- ▸Allergens, bacteria, viruses, fungi, venom

**ANTIBODY:** Fights against the **antigen**

- ▸A protein made of plasma cells (type of WBC) created in response to antigen

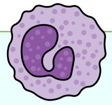
## TYPES OF LEUKOCYTES (WBC)

### NEUTROPHILS



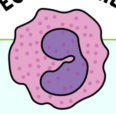
- →First cells that respond to foreign organisms
- →Ingests & releases enzymes to kill invaders
- →Boosts response of other immune cells

### BASOPHILS



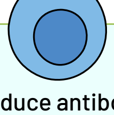
- → Defend against allergens, parasites & pathogens
- → Release:
  - ▸**Leukotrienes** (allergy response)
  - ▸**Cytokines** (immune regulator)
  - ▸**Histamines** (inflammatory response)

### EOSINOPHILS



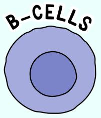
- →Defend against parasitic & bacterial infections
- →Regulate inflammatory response

### LYMPHOCYTES



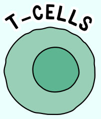
Produce antibodies & directly attack invaders

#### B-CELLS



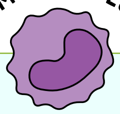
- →Create antibodies
- →Attack invaders & abnormal cells

#### T-CELLS



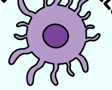
- →Directly attack infected foreign cells
- →Stimulate b-cells to make antibodies

### MONOCYTES



Surround, ingest, kill & remove foreign substances

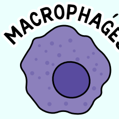
#### DENDRITIC CELLS



Initiate & regulate immune response

Think **DENDRITE** like in neuro (communicate to other cells)

#### MACROPHAGES



PHAGE MEANS EAT

Surround & kill foreign cells

## NORMAL RANGES

**WBC:** 4,500-11,000/ uL

**NEUTROPHILS:** 40-70%

**BASOPHILS:** 0.1-2%

**EOSINOPHILS:** 1-5%

**LYMPHOCYTES:** 20-40%

**MONOCYTES:** 4-13%

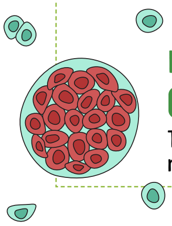
# CANCER OVERVIEW

## WHAT IS IT?

Disease caused by uncontrolled division of abnormal cells in the body that spread to other tissues

↳ Invasion of cells into other tissues cause affected areas to not function properly

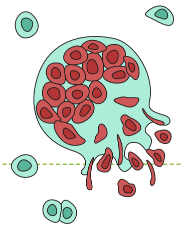
## TYPES of TUMORS



### BENIGN

**NON-CANCEROUS**

Tends to grow slowly and does not spread to other tissues



### MALIGNANT

**CANCEROUS**

Grows rapidly & spreads to other tissues

## RISK FACTORS

### MODIFIABLE

- Tobacco & alcohol use
- Obesity
- Sedentary lifestyle
- Poor diet
- Excessive UV exposure

### NON-MODIFIABLE

- Older age
- Family history
- Bacterial/ viral infections

## CARCINOGENESIS

The process of normal cells turning into cancer cells

| STAGE 1 | STAGE 2 | STAGE 3 |
|---|---|---|
| **INITIATION** | **PROMOTION** | **PROGRESSION** |
| Cell mutation occurs (irreversible) → | Transformed cells divide → | Tumor grows (cancer cells compete with normal cells) |

## TNM STAGING

Used to stage the current state & progression of main tumor

### TUMOR

Size & extent into other tissues

**TX:** Tumor can't be measured

**T0:** Tumor can't be found

**TIS:** Tumor in situ (inside original place)

**T1 TO T4:** Size & extent of tumor

↳ ↑ NUMBER = ↑ SPREAD INTO OTHER TISSUES

### NODES

Spread into nearby lymph nodes

**NX:** Cancer can't be measured in lymph nodes

**N0:** No cancer in nearby lymph nodes

**N1 TO N3:** Location & # of lymph nodes affected

↳ ↑ NUMBER = ↑ # OF LYMPH NODES AFFECTED

### METASTASIS

Spread into other parts of the body

**MX:** Metastasis cannot be measured

**M0:** No metastasis

**M1:** Cancer has spread to other tissues

**APPLIES TO PRIMARY TUMOR ONLY**

## TUMOR GRADING

Grades how abnormal cancer cells are based on biopsy

| GRADE I | GRADE II | GRADE III | GRADE IV |
|---|---|---|---|
| Well differentiated (resembles normal cells) | Moderately differentiated | Poorly differentiated | Undifferentiated (cells extremely abnormal) |

## GENERAL CANCER SYMPTOMS

**C**hanges in bowel or bladder habits

**A** sore that doesn't heal

**U**nusual discharge or bleeding

**T**hickening/ lump/ mass or tumor

**I**ndigestion or difficulty swallowing

**O**bvious changes in moles or warts

**N**agging cough or persistent hoarseness

## DIAGNOSTICS

**TUMOR MARKER TESTS:** Tests for specific markers produced by or in response to tumor

**PET SCAN:** Use of an injected tracer (radioactive glucose) & then pictures taken to expose cancer cells

**CT SCAN:** Will show solid tumor masses

**BIOPSY:** Sample of the abnormal tissue is removed and tested for cancer cells

# TYPES OF CANCER

## LUNG CANCER

### SYMPTOMS

- Cough that doesn't go away
- Unintentional weight loss
- Coughing up blood
- Chest pain
- Shortness of breath

### DIAGNOSTICS

- Sputum cytology
- Imaging tests
- Lung biopsy

### TREATMENT

- Chemotherapy
- Radiation therapy
- Immunotherapy
- Lobectomy

## COLORECTAL CANCER

### SYMPTOMS

- Changes in bowel patterns
- Blood in the stool
- Persistent abdominal pain

### DIAGNOSTICS

- Colonoscopy
- Imaging tests
- CarcinoEmbryonic Antigen (CEA)

### TREATMENT

- Polypectomy (removal of polyps during colonoscopy)
- Laparoscopic surgery
- Endoscopic mucosal resection
- Colectomy
- Lymph node removal

## PROSTATE CANCER

### SYMPTOMS

- Urinary changes
- Dysuria
- Frequency
- Weak stream
- Blood in urine or semen

### DIAGNOSTICS

**GOLD STANDARD**
- Prostate-Specific Antigen (PSA) Test
- Biopsy using Transrectal US or MRI

### TREATMENT

- Radical prostatectomy
- Chemotherapy
- External beam radiation therapy (with or without brachytherapy)
- Hormone therapy

## SKIN CANCER

### SYMPTOMS

REMEMBER **ABCDE**

**A**symmetry (opposing sides do not match)

**B**order (edges are irregular, ragged, blurred)

**C**olor (more than one color present)

**D**iameter (larger than 6mm)

**E**volving (changing in size, shape, color, etc.)

### DIAGNOSTICS

- Skin biopsy
- Imaging tests

### TREATMENT

- Cryotherapy
- Mohs micrographic surgery
- Chemo & radiation
- Immunotherapy

## TESTICULAR CANCER

### SYMPTOMS

- Lump or swelling in testicles
- Feeling of heaviness in the scrotum
- Pain in testicle or scrotum
- Groin or lower abdominal pain

### DIAGNOSTICS

- Tumor marker tests
- Imaging tests

### TREATMENT

- Chemotherapy
- Radiation therapy
- Immunotherapy
- Surgery

## BREAST CANCER

### SYMPTOMS

- Lump in breast or armpit
- Swelling or thickening of breast
- Dimpling of skin
- Nipple retraction
- Discharge (not breast milk)

### DIAGNOSTICS

- Mammogram
- Biopsy
- CT/ PET Scan

### TREATMENT

- Chemotherapy & radiation
- Hormone therapy
- Mastectomy
- Lumpectomy

# CANCER TREATMENTS & COMPLICATIONS

## TREATMENT

### CHEMOTHERAPY

Targets & kills cancer cells through the use of cytotoxic chemical substances

**ROUTES**

- Oral
- Intravenous
- Intramuscular
- SQ injection
- Intrathecal (spinal canal)

### RADIATION

Use of high energy particles or high energy waves to kill cancer cells

**ROUTES**

- External beam (machine aims at targeted area)
- Brachytherapy (radioactive material sealed in seeds/ capsules placed inside body on or near tumor)
- Systemic (oral or IV medications containing radioactive material)

### OTHER THERAPIES

**IMMUNOTHERAPY**

Uses body's immune system to fight cancer (AKA biologic therapy)

**HORMONE THERAPY**

Blocks or lowers hormones in body that cancer is using to grow

**CRYOABLATION**

Needle is injected directly into tumor to freeze and kill it

**TARGETED THERAPY**

Targets specific genes & proteins contributing to cancer growth

## COMPLICATIONS

### NEUTROPENIA

Abnormally low WBC's

**CAUSE**

While chemo kills the cancer cells, it also kills other healthy cells (like WBC)

**NURSING INTERVENTIONS**

→Infection prevention
→Neutropenic precautions
→Hand hygiene

### ALOPECIA

Hair loss

**CAUSE**

Chemo drugs also attack cells in **hair follicles** causing hair loss all over the body

**NURSING INTERVENTIONS**

→Cooling cap
→Use of wig, scarf, hat
→Diet rich in protein & iron

### LYMPHEDEMA

Fluid build up in lymph nodes

**CAUSE**

Radiation therapy can damage lymph vessels, causing lymphatic fluid to not drain properly

**NURSING INTERVENTIONS**

→Manual lymph drainage
→Compression bandaging
→Limb elevation

### MUCOSITIS

Inflammation of mouth or GI tract

**CAUSE**

Chemo & radiation interfere with normal turnover of epithelial cells, leading to breakdown of lining

**NURSING INTERVENTIONS**

→Good oral hygiene
→Ice chips & lip moisturizer
→Brushing with soft toothbrush
→Salt and soda rinses

### MALNUTRITION

Lack of nutrients in body

**CAUSE**

Cancer treatments can cause malabsorption of nutrients or decreased appetite from nausea

**NURSING INTERVENTIONS**

→Small, frequent meals
→↑ calorie ↑ protein (protein shakes)
→Calorie dense foods
(nut butters & dried fruits)

### THROMBOCYTOPENIA

Abnormally low platelets

**CAUSE**

Chemo & radiation destroy cells in the bone marrow that produces platelets

**NURSING INTERVENTIONS**

→Platelet transfusions
→Bleeding precautions
→Avoid NSAIDs & Aspirin

# LEUKEMIA

## WHAT IS IT?

Group of cancers that occur due to rapid proliferation of abnormal **white blood cells**

Grouped by **DISEASE PROGRESSION** & **TYPE OF WBC INVOLVED**

### DISEASE PROGRESSION

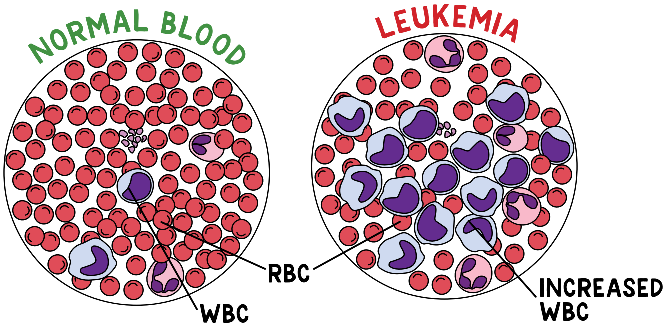
**ACUTE LEUKEMIA:** develops quickly (days to weeks)
↳ Abnormal WBC's don't have time to mature

**CHRONIC LEUKEMIA:** develops slowly (months to years)
↳ Abnormal WBC's have time to mature

### TYPE OF WBC INVOLVED

**MYELOID LEUKEMIA:** affects myeloid cell line
↳ Eosinophils, basophils & neutrophils

**LYMPHOID LEUKEMIA:** affects lymphoid cell line
↳ B-cells & T-cells



## DIAGNOSTICS

→ **COMPLETE BLOOD COUNT**
- ↑ WBC (can be >30,000)
- ↓ HGB ↓ HCT
- ↓ PLT

→ **BLOOD SMEAR:** may show ↑ blast cells (immature WBC)
MYELOBLASTS= AML | LYMPHOBLASTS= ALL

→ **BONE MARROW BIOPSY:** may show ↑ blast cells (immature WBC)

| TYPE | RISK FACTORS | SYMPTOMS | TREATMENT |
|---|---|---|---|
| **ACUTE LYMPHOID**<br>Rapid reproduction of immature lymphocytes in bone marrow<br>MOST COMMON IN CHILDREN | → Genetics<br>→ Congenital disorders (Down's Syndrome)<br>→ Viral infections (Epstein-Barr) | → Fever<br>→ Bone & joint pain<br>→ Anemia (fatigue, pallor, dyspnea)<br>→ Splenomegaly<br>→ Swollen glands<br>→ Frequent infections<br>→ Weight loss<br>May take several years for symptoms to appear in CHRONIC LEUKEMIAS | → Chemotherapy<br>→ Radiation<br>→ Bone marrow transplant<br>→ Immunotherapy |
| **ACUTE MYELOID**<br>Rapid reproduction of immature myelocytes in bone marrow | → Age (peaks at 60)<br>→ Gender (males)<br>→ Radiation<br>→ **Long term Benzene exposure** | | → Chemotherapy<br>→ Radiation<br>→ Bone marrow transplant<br>→ Immunotherapy |
| **CHRONIC LYMPHOID**<br>Slow progression of abnormal B-cell reproduction over time<br>MOST COMMON IN ADULTS | → Genetics<br>→ Family history<br>→ Gender (males)<br>→ **Radon exposure** | | → Chemotherapy<br>→ Targeted therapy **(Rutuximab)**<br>→ Bone marrow transplant<br>→ Radiation |
| **CHRONIC MYELOID**<br>Slow progression of abnormal myelocyte reproduction over time | → Age (↑ with age)<br>→ Gender (males)<br>→ Radiation exposure | | → Tyrosine Kinase Inhibitor **(Gleevec)**<br>→ Chemotherapy<br>→ Stem cell transplant |

## NURSING INTERVENTIONS

### INFECTION PREVENTION
- Good hand hygiene
- Neutropenic precautions in hospital
- Avoid crowded places
- Avoid people who are sick

### BLEEDING PRECAUTIONS
- Use electric razor
- Avoid forcefully blowing nose
- Avoid straining during BM's
- Soft toothbrush

### DIET RECOMMENDATIONS
- ↑ protein ↑ calorie
- Adequate fluid intake
- Avoid raw foods (raw vegetables, uncooked meat)

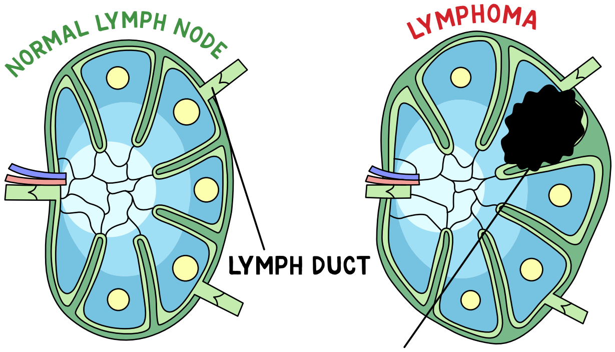
# LYMPHOMA

## WHAT IS IT?

Cancer of the **lymphatic system**

### THE LYMPHATIC SYSTEM INCLUDES:

① **LYMPH NODES:** filter substances in lymphatic fluid
② **LYMPHATIC VESSELS:** carries lymphatic fluid & WBC's
③ **SPLEEN:** filters and stores blood
④ **THYMUS:** production & maturation of T-cells
⑤ **BONE MARROW:** produce blood cells (including WBC's)



Lymph ducts become blocked by cancer cells, causing lymphatic fluid build up

## RISK FACTORS

**EXACT CAUSE UNKNOWN**

- Age (>55 years old)
- More common in males
- Impaired immune system
  - Autoimmune disease
  - Immunosuppresants
- Family history
- Infections
  - Epstein-Barr
  - Herpes

## TYPES OF LYMPHOMA

Classified by the type of lymphocyte affected

| HODGKIN'S LYMPHOMA | NON–HODGKIN'S LYMPHOMA |
|---|---|
| Reed-Sternberg lymphocyte is **present** | Reed-Sternberg lymphocyte is **absent** |

## SYMPTOMS

- Swollen, painless lymph nodes
- Enlarged liver or spleen
- Fatigue
- Fever without infection
- Night sweats
- Weight loss

### COMPLICATION: SUPERIOR VENA CAVA SYNDROME

Superior Vena Cava becomes **blocked** by enlarged lymph nodes

- Dyspnea
- Facial edema
- Distended neck veins
- Cough

**MEDICAL EMERGENCY** ⚠

## DIAGNOSTICS

- **LYMPH NODE BIOPSY:** assess for Reed-Sternberg cells
- **IMAGING TESTS (CT SCAN/ PET SCAN/ MRI)**
- **BONE MARROW BIOPSY**

## TREATMENT

- Chemotherapy
- Radiation
- Bone marrow transplant
- Stem cell transplant
- Targeted therapies (Gleevec)

## NURSING INTERVENTIONS

- Administer antiemetics for nausea
- Monitor I & O
- Encourage adequate fluid intake
- Monitor CBC & electrolytes
- Monitor infusion site for irritation
- Daily weights
- Neutropenic precautions
  - Private room
  - No flowers or fresh fruits
  - Visitors & staff wear PPE (gown, gloves, mask)

### EDUCATION

- Good hand hygiene
- Avoid large crowds
- Cook food thoroughly
- ↑ protein ↑ calorie diet
- Small, frequent meals
- Avoid GI irritants (spicy food)
- Soft toothbrush
- Allow adequate rest

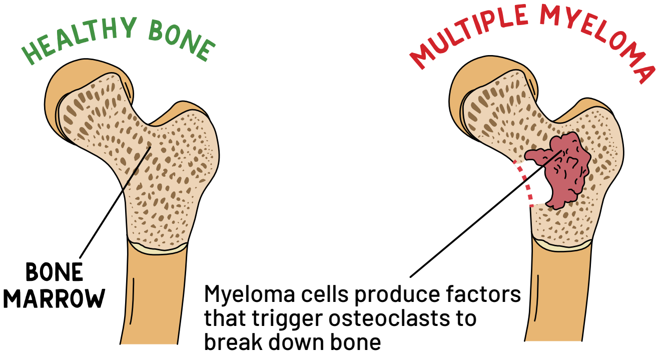
# MULTIPLE MYELOMA

## WHAT IS IT?

Cancer of the **plasma cells in the bone marrow**

**PLASMA CELLS** develop from **B-CELLS** (type of lymphocyte) and play a key role in **immunity**

Cancer is within plasma cells (called myeloma cells) and causes excess production of abnormal plasma cells causing **PANCYTOPENIA** & **↑ RISK OF INFECTION**



Myeloma cells produce factors that trigger osteoclasts to break down bone

## RISK FACTORS

- Age (> 60 years old)
- Family history
- Radiation or chemical exposure (Benzene, environmental toxins)
- Viral infections
  - HIV
  - Epstein-Barr

## DIAGNOSTICS

- **LABS:** CBC & BMP
  - ↓ WBC
  - ↓ HGB ↓ HCT
  - ↓ PLT
  - ↓ GFR
  - ↑ Creatinine
  - ↑ BUN
- **24 HOUR URINE:** assess for **M proteins** (Bence Jones)
- **BONE MARROW BIOPSY:** ↑ monoclonal plasma cells

**+ CRAB CRITERIA**

## SYMPTOMS

**SYMPTOMS USUALLY DON'T SHOW UNTIL REACHES ADVANCED STAGE**

### Ⓒ HYPERCALCEMIA

Calcium spilling into bloodstream from bone marrow

- Bone pain
- Fractures
- Confusion
- EKG changes
- Muscle weakness
- Fatigue

### Ⓡ RENAL INSUFFICIENCY

Renal tubules unable to filter out excess proteins

- ↓ urine output
- Proteinuria
- Edema

### Ⓐ ANEMIA

Healthy RBC's crowded out by cancerous plasma cells

- Fatigue
- Dyspnea
- Pallor

### Ⓑ BONE DISEASE

Osteoclast triggering factors stimulate bone destruction

- "Lytic" lesions (area of bone damage)
- Osteoporosis

## TREATMENT

**NO CURE: SURVIVAL RATE 3-5 YEARS**

- Chemotherapy
- Radiation
- Bone marrow transplant
- **Steroids:** kill myeloma cells & ↓ inflammation
- Monoclonal antibodies

### SYMPTOMATIC TREATMENT

- **Erythropoietin:** stimulate bone marrow
- **Bisphosphonates:** prevent bone loss
- **Blood transfusions:** for pancytopenia

## NURSING INTERVENTIONS

- Monitor & manage pain
- Monitor I & O
- Encourage adequate fluid intake (prevent kidney stones)
- Monitor CBC & electrolytes
- Neutropenic precautions
- Bleeding precautions
- Fall risk (↑ risk of fractures & bleeding)

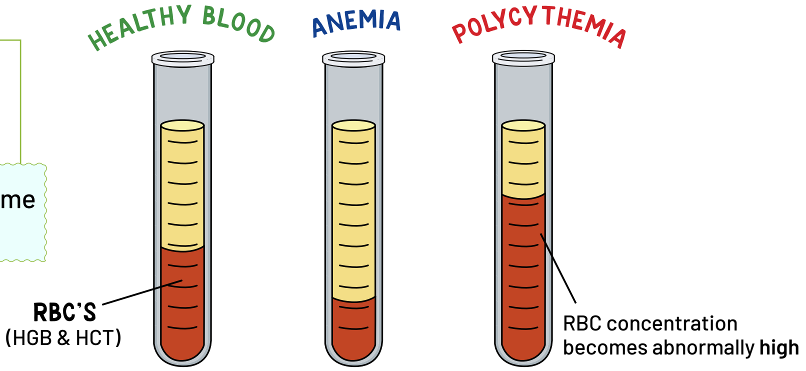
# POLYCYTHEMIA

## WHAT IS IT?

Increased number of RBC's due to malignant change in **bone marrow cells**

High concentration of RBC's cause blood to become thick and increases risk of **THROMBOSIS**

In many cases, **white blood cells and platelets** will also be elevated as well



## RISK FACTORS

**PRIMARY** (DUE TO JAK2 GENE MUTATION)

- Gender (more common in males)
- Age (>50 years old)
- Radiation or toxin exposure

**SECONDARY** (DUE TO CHRONIC HYPOXEMIA)

- COPD
- Obesity
- Hypertension
- Smoking & alcohol abuse

## SYMPTOMS

- Dizziness
- Headaches
- Flushed, ruddy complexion
- Fatigue
- Finger clubbing
- Severe itching after hot shower
- Splenomegaly or hepatomegaly

### COMPLICATION: MYELODYSPLASTIC SYNDROME

Group of disorders where RBC, PLT & WBC die too fast

| ANEMIA | THROMBOCYTOPENIA | LEUKOCYTOSIS |
|---|---|---|
| ▸Fatigue | ▸Prolonged bleeding | ▸Fever |
| ▸Dyspnea | ▸Petechiae | ▸Tachycardia |
| ▸Pallor | ▸Bruising | ▸Frequent infections |

May develop into **ACUTE MYELOID LEUKEMIA**

## TREATMENT

**NO CURE**

**GOAL: ↓ RBC & risk of thrombosis**

- **HYDROXYUREA:** Antineoplastic to ↓ RBC production
- **PHLEBOTOMY:** ↓ blood volume
- **ASPIRIN:** prevent thrombosis

## TYPES OF POLYCYTHEMIA

| PRIMARY | SECONDARY |
|---|---|
| Presence of **JAK2 gene mutation** | Underlying issue causes hypoxemia |
| ↓ | ↓ |
| JAK2 gene stimulates RBC production | ↓ O2 stimulates kidneys to produce erythropoietin |
| ↓ | ↓ |
| Excessive production of RBC's | Excessive production of RBC's |

## DIAGNOSTICS

- **LABS**
  - ↑ WBC
  - ↑ HGB ↑ HCT
  - ↑ PLT
  - ↑ erythropoetin (in secondary)
- **GENE TESTING:** assess for JAK2 gene mutation
- **BONE MARROW BIOPSY**
- **X-RAY/ US/ CT SCAN:** assess for secondary cause

## NURSING INTERVENTIONS

- IV fluids as order to ↓ blood viscosity
- Monitor VS & labs
- Assess for signs of excess bleeding
- VTE prophylaxis
  - Early ambulation
  - Avoid crossing legs
  - SCD's if on bedrest

| AVOID | RECOMMENDED |
|---|---|
| ▸Low oxygen environments | ▸Nutrient dense foods |
| ▸Extreme temperatures | ▸Adequate fluid intake |
| ▸Contact sports | ▸Lukewarm baths (not hot) |
| ▸Smoking | ▸Balance rest with activity |

# HIV/ AIDS

## WHAT IS IT?

**HIV** (**H**uman **I**mmunodeficieny **V**irus)

Virus that attacks the body's immune system (specifically cells with **CD4 receptors**)

**AIDS** (**A**cquired **I**mmunodeficiency **S**yndrome)

Late stage of HIV that occurs due to extreme damage to the immune system

**HIV** is a **retrovirus** meaning it has RNA instead of DNA as its genetic material

↳ uses an enzyme called **reverse transcriptase** to become part of the host cell DNA

## RISK FACTORS

Transmitted through **BLOOD & BODY FLUIDS**

- → Sharing infected needles
- → Unprotected sex
- → Blood transfusion
- → Maternal HIV
  (passed from +HIV mother to baby)

## SYMPTOMS

MAY NOT HAVE SYMPTOMS FOR UP TO **10 YEARS**

### ACUTE STAGE: INITIAL INFECTION TO 2 MONTHS

Spike in HIV replication & drop in t-cells

**FLU-LIKE SYMPTOMS**:
- Fever
- Fatigue
- Swollen lymph nodes
- Muscle aches

### CHRONIC STAGE: CAN LAST UP TO 10 YEARS

CD4 count between 200-500 & HIV continues to replicate

**MAY BE ASYMPTOMATIC!**

↳ but still able to transmit disease to others

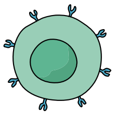
### AIDS: END STAGE

CD4 count< 200 and oppurtunistic diseases present

- Tuberculosis
- Pneumonia
- Herpes simplex virus
- Kaposi's Sarcoma (oppurtunistic cancer)
- Wasting syndrome
- Thrush

## CELLS ATTACKED BY HIV: WBC with **CD4 receptors**

↳ Mainly "HELPER" T-CELLS



- Attack invader cells
- Stimulate b-cells to make antibodies

## OTHER CELLS AFFECTED:

- B-Cells
- Monocytes
- Dendritic cells
- Macrophages

## DIAGNOSTICS

→ **ELISA TEST:** asseses how body responds to antibodies created by HIV

↳ **NOT FOR DEFINITIVE DIAGNOSIS**

→ **WESTERN BLOT TEST:** used to confirm ELISA & confirm presence of HIV

→ **NUCLEIC ACID TEST:** assesses viral load **(earliest detection)**

→ **CD4 COUNT:** measures t-cells to assess disease severity

>500: STAGE 1

200–499: STAGE 2

<200: STAGE 3

## TREATMENT

**NO KNOWN CURE**

**GOAL:** Slow progression from HIV to AIDS

↳ **EARLIER TREATMENT= BETTER OUTCOMES**

### ANTIRETROVIRAL THERAPY

① Nucleoside reverse transcriptase inhibitors
② Non-nucleoside reverse transcriptase inhibitors
③ Integrase strand transfer inhibitors
④ Protease inhibitors
⑤ Entry inhibitors
⑥ CCR5 antagonists

★ **Medication compliance extremely important** or patient may develop resistance & treatment won't work

## EDUCATION

- ⋆ Medication compliance
- ⋆ Limit alcohol use
- ⋆ No smoking
- ⋆ Stress management
- ⋆ Keep up on vaccines
- ⋆ Good hand hygiene
- ⋆ Avoid large crowds
- ⋆ Don't share personal items with others
- ⋆ Practice safe sex
- ⋆ Healthy diet
- ⋆ Avoid raw foods

# LYME DISEASE

## WHAT IS IT?

Tick-borne illness caused by the **BORRELIA BURGDORFERI BACTERIA**

## RISK FACTORS

- Living in grassy, bushy and wooded areas
- Regions with widespread **deer ticks**
- Frequent hiking and outdoor activities

## PATHO

BITE OF INFECTED TICK WITH BORRELIA BURGDORFERI

↓

BACTERIA ENTERS THE BLOODSTREAM

↓

SPREADS THROUGH BLOODSTREAM & ATTACKS ORGANS & TISSUES

↓

CAUSES BODY TO HAVE AN **INFLAMMATORY RESPONSE**

## LYME DISEASE STAGES

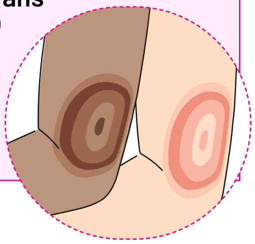
### LOCALIZED

Starts within **1 month** of tick bite

- Flu-like symptoms
- Muscle or joint pain
- Swollen lymph nodes
- **Erythema migrans (Bullseye rash)**

**HALLMARK SIGN**

may occur within 3-30 days of bite



### DISSEMINATED

Occurs **weeks to months** after initial infection

- Transient migratory arthritis (pain resolves in one joint & moves to another)
- Facial nerve palsy
- Cariditis

MOST COMMON:
- Knees
- Wrists
- Ankles

### LATE DISSEMINATED

Occurs **months to years** after initial infection

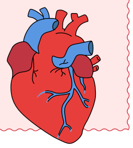
- Chronic arthritis
- Encephalopathy
- Fatigue
- Memory loss
- Personality changes
- Peripheral nerve damage

### COMPLICATION: LYME CARDITIS

Borrelia burgdorferi bacteria enters the heart tissue

**SYMPTOMS**

- Chest pain
- Shortness of breath
- Heart palpitations
- Syncope



Can lead to **ARRHYTHMIAS & HEART BLOCKS**

## DIAGNOSTICS

- **ELISA TEST:** assess for antibodies against Borrelia Burgdorferi bacteria
- **WESTERN BLOT:** confirmation of ELISA

## TREATMENT

- **Antibiotics**
  - **Early stage:** Doxycycline
  - **Late stage:** Ceftriaxone
- **NSAIDs:** ↓ inflammation

## NURSING INTERVENTIONS

- Monitor VS & EKG
- Cool compress to painful and swollen joints
- Promote calm environment
- ROM exercises
- Assess and monitor skin for rash
- **Educate patient to finish entire course of antibiotics**

# PSORIASIS vs. ECZEMA

Two integumentary disorders due to **IMMUNE SYSTEM RESPONSE**

## PSORIASIS

Overproduction of keratin in epidermis skin layer

**AUTOIMMUNE DISORDER**

### COMMON AREAS AFFECTED

Usually on **SYMMETRICAL** sides of the body

- Scalp
- Elbows
- Knees
- Lower back
- Palms of hands
- Soles of feet

### SYMPTOMS

- Mild-moderate itching
- Scaly patches on skin
- Silvery white, shiny scales
- Pitting/ crumbling nails

### TRIGGERS

- Stress
- Illness/ surgery
- **Streptococcus**
- **Injury to skin**
- **Friction to skin**
- **Medications (Lithium)**

### TREATMENT

- **Topical steroids:** ↓ inflammation
- **Methotrexate:** ↓ immune response
- **Tar:** ↓ growth of skin cells
- **UV light therapy:** ↓ growth of skin cells

### EDUCATION

- Promptly treat strep infections
- Avoid gluten & alcohol
- Avoid scratching skin
- Keep skin moisturized
- Stress management
- Avoid harsh temperatures

AKA **ATOPIC DERMATITIS**

## ECZEMA

Type of dermatitis that occurs due to weakened skin barrier

**INFLAMMATORY DISORDER**

### COMMON AREAS AFFECTED

Usually in areas where there **is skin-to-skin contact**

- Elbow creases
- Buttocks
- Under arms
- Groin
- Back of knees
- Front of neck

### SYMPTOMS

- Severe itching
- Redness & inflammation
- Fluid filled bumps
- Crusty & oozing

### TRIGGERS

- Stress
- Illness/ surgery
- **Sweat**
- **Overheating**
- **Harsh soaps/ cleansers**
- **Allergens (pet dander, mold)**

### TREATMENT

- **Topical steroids:** ↓ inflammation
- **Moisturizers** (avoid dry skin)
- **Antihistamines:** ↓ itching
- **Emollients:** keep moisture in skin

### EDUCATION

- Take warm showers (not hot)
- Adequate fluid intake
- Shower daily
- Keep nails short (avoid injuring skin)
- Moisturize skin immediately after bathing
- Avoid scrubbing skin

# SYSTEMIC LUPUS ERYTHEMATOSUS

## WHAT IS IT?

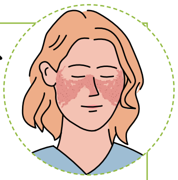
Autoimmune disease that causes systemic inflammation of the **connective tissue**

Characterized by periods of
**EXACERBATIONS & REMISSIONS**

## RISK FACTORS

- Race (more common in black, latina & asian women)
- Age (women of childbearing years)
- Gender (more common in women)
- Family history
- Too much sun exposure
- Medications
  - Hydralazine
  - Isoniazid

## SYMPTOMS



- **Butterfly rash** HALLMARK SIGN
- Fatigue
- Fever
- Joint pain, stiffness & swelling
- Raynaud's phenomenon
- Sun sensitivity
- Anemia symptoms
  - Fatigue
  - Pallor
  - Shortness of breath
- Hair loss
- Oral lesions

fingers & toes become **numb, pale & cold** in response to low O2

Lupus can cause damage to **anywhere in the body** & cause multiple complications, such as:

- Nervous system (seizures)
- Heart (pericarditis)
- Lungs (pleural effusion)
- Digestive system (colitis)
- Kidneys (lupus nephritis)

**PHAGOCYTOSIS** process doesn't work properly, causing apoptic cells (dead cells) to stay in body

**APOPTOSIS:**
Programmed cell death for unneeded/ abnormal cells

Body thinks content in apoptic cells are antigens & creates **antigen-antibody complexes** which get lodged in connective tissue and cause **INFLAMMATION**

## DIAGNOSTICS

★ **POSITIVE ANA TITER:** anti-nuclear antibodies formed in response to apoptic cell contents

- ↑ **CRP** & ↑ **ESR:** from inflammatory response
- **ANTI-SMITH ANTIBODY:** antibody found in nucleus specific to lupus
- **ANTI-DSDNA ANTIBODY:** antibody found during active lupus disease
- **LABS:** depending on where the antibodies have targeted, may have:
  - ↓ WBC
  - ↓ HGB ↓ HCT
  - ↓ PLT
  - ↓ GFR
  - ↑ Creatinine
  - ↑ BUN

## TREATMENT

**NO KNOWN CURE**

**GOAL: PREVENT & CONTROL FLARE UPS**

- **Immunosuppressants:** ↓ immune response
  - Methotrexate
  - Hydroxychloroquine
- **Steroids:** ↓ inflammation quickly in flare ups (not for long term use)
- **NSAIDs:** ↓ inflammation & pain

## EDUCATION

- Avoid sun exposure
- Always wear sunscreen
- Get enough sleep
- Stress management
- Regular exercise
- Avoid sick people

Know the signs for
**FLARE UPS**

- **F** Fatigue
- **L** Low grade fever
- **A** Achy joints
- **R** Rash
- **E** Edema of legs & hands

## NURSING INTERVENTIONS

- Apply cold packs to joints
- Active & passive range of motion
- Plan care with periods of rest

**MONITOR:**

- VS & EKG
- I & O
- CBC, LFT, BMP (can affect all organs!)
- Skin & mucous membranes
- Pain

# CRITICAL CARE

# ACLS & BLS CHEAT SHEET

WHAT'S THE DIFFERENCE
BETWEEN BLS & ACLS?

## BASIC LIFE SUPPORT

**BASIC CPR GUIDELINES** → can use this in any first responder situation

## STEP-BY-STEP BLS

### ① SCAN THE SCENE FOR SAFETY

### ② ASSESS FOR RESPONSE

"Hey hey are you okay?"

### ③ CALL FOR HELP

- Activate emergency response system/shout for nearby help
- Delegate someone to call 911 & get AED

### ④ ASSESS BREATHING & PULSE

- Check **carotid** pulse
- Check for chest rise or gasping

**NO LONGER THAN 10 SECOND ASSESSMENT!**

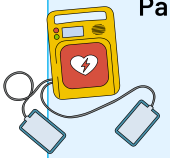
**NO PULSE + ABNORMAL BREATHING**

↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓

### ⑤ START CPR

Start cycle of **30 chest compressions & 2 breaths**

### ⑥ USE AED AS SOON AS IT ARRIVES



**Pad placement**→ **HIGH RIGHT LOW LEFT**

- One pad on upper right chest & one on lower left chest
- Make sure skin is dry & avoid hairy patches
- Clear the patient (ensure no one is touching patient)
- Deliver shock if advised by AED

### ⑦ RESUME CPR IMMEDIATELY

- Continue for 2 minutes then check pulse
- Follow cycle until help arrives or patient becomes responsive

## ADVANCED CARDIAC LIFE SUPPORT

Set of clinical guidelines grouped into different algorithms based on the clinical situation that involves **CPR, medications, & medical procedures**

## ACLS CARDIAC ARREST ALGORITHM

### ① START CPR

- Compressions→ Rate 100-120 per minute
- Oxygen→ 30:2 ventillation ratio
- Attach monitor & defibrillator pads

### ② CHECK THE RHYTHM

- Check the rhythm for no more than 10 seconds
- Compressions are stopped during rhythm check

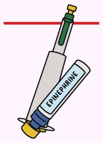
**SHOCKABLE**
→V. Fib
→Pulseless Vtach

**NON-SHOCKABLE**
→PEA
→Asystole

### SHOCKABLE RHYTHMS

① Resume CPR immediately while charging defibrillator
② Clear & shock patient
③ Give epinephrine every 3-5 minutes
④ Consider intubation (capnography to confirm placement)
⑤ After 2 mins rhythm check & shock (if shockable)
⑥ Give amiodarone or lidocaine
⑦ Treat reversible causes

### NON-SHOCKABLE RHYTHMS



**NO ELECTRICAL CONDUCTION!**
shock provides no benefit

① Give epinephrine ASAP & every 3-5 minutes
② Consider intubation (capnography to confirm placement)
③ Treat reversible causes

**REMEMBER YOUR H's & T's**

- Hypoxia
- Hypovolemia
- Hydrogen ions (acidosis)
- Hyper/hypokalemia
- Hypothermia

- Tension pneumothorax
- Tamponade
- Toxins
- Thrombosis (coronary) MI
- Thrombosis (pulmonary) PE

## HIGH QUALITY CPR

| POSITIONING | COMPRESSIONS | BREATHING |
|---|---|---|
| Heels of hands on top of each other<br>Shoulders directly over the hands & elbows locked<br>Ensure patient is positioned on firm surface | Minimum rate of 100-120 compressions/ min<br>Compression depth 2-2.4 inches<br>Allow full chest recoil after each compression | 2 breaths every 30 compressions<br>Head-tilt/ chin-lift to open airway<br>Assess for chest rise with each breath<br>AVOID excessive ventilation |

# ARTERIAL LINES

## WHAT IS IT?

A thin catheter inserted into an artery for **hemodynamic monitoring**

## SITES USED

- Radial MOST COMMON
- Brachial
- Femoral INFECTION RISK
- Axillary
- Ulnar
- Dorsalis pedis

## TRANSDUCER

Connects catheter to monitor so measurement can occur

**LOCATION:** Aligned to height of **right atrium**

↳ **PHLEBOSTATIC AXIS**
4th intercostal space, mid-axillary line

★ **MUST BE LEVELED PROPERLY FOR ACCURATE READING**

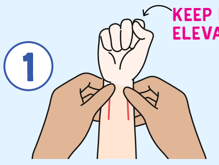
## COMPLICATIONS

- Thrombosis
- Ischemia
- Hematoma formation
- Infection
- Bleeding
- Dislodgement
- Air embolus
- Pain/ swelling

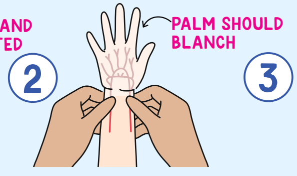
## ALLEN'S TEST

REVERSE ALLEN'S MEASURES RADIAL ARTERY

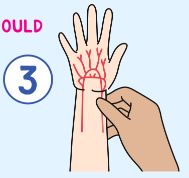
Used prior to insertion to test patency & blood flow of the **ulnar artery**



Have patient clench hand & apply pressure to radial & ulnar artery with thumbs



Have patient unclench hand while maintaining pressure on both arteries



Release pressure from **ulnar artery only** & assess skin color in hand for perfusion

If hand flushes within 15 seconds= **POSITIVE RESULT**

↳ adequate blood flow for arterial puncture

## NURSING INTERVENTIONS

→ Neurovascular checks

→ Monitor waveform
(zero Q4 or if inaccuracy is suspected)

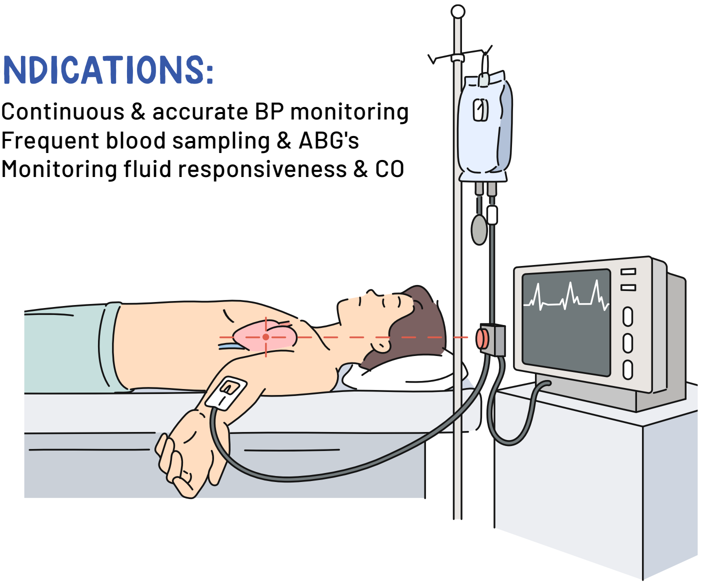
→ Monitor blood pressure & compare to cuff BP

→ Monitor site for:

- Bleeding
- Dislodgement
- Hematoma
- Infection

## INDICATIONS:

- Continuous & accurate BP monitoring
- Frequent blood sampling & ABG's
- Monitoring fluid responsiveness & CO



## WAVEFORM ASSESSMENT

Arterial waveforms go up & down with the blood pressure & show accuracy of BP measurement

**INACCURATE BP READINGS LEAD TO INACCURATE TREATMENT!**

↳ TO MEASURE ACCURACY

### SQUARE WAVE TEST

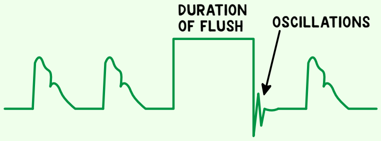
Rapidly flush the line by pulling the release on the flush device→ this generates a **square wave**

→ **ASSESS OSCILLATIONS & WAVE TO DETERMINE ACCURACY**

### NORMAL WAVE

1 to 2 oscillations

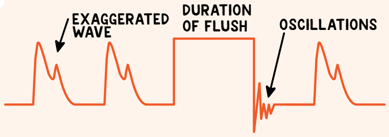
**ACCURATE READING**



### UNDERDAMPED WAVE

>2 oscillations

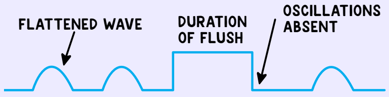
**FALSE HIGH BP**



### OVERDAMPED WAVE

<1 oscillation

**FALSE LOW BP**



### IF WAVE OVERDAMPED OR UNDERDAMPED:

→ Ensure there are no kinks in tubing
→ Check pressure bag is inflated fully
→ Check for air bubbles or clots in tubing
→ Relevel and rezero transducer

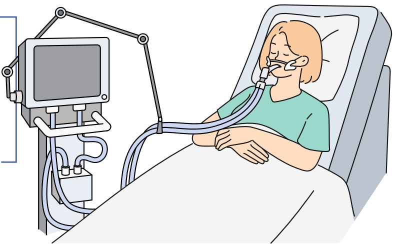
# MECHANICAL VENTILATION
## BASICS

## WHAT IS IT?

A machine that takes over functions of breathing for patients that cannot breathe on their own

**USES POSITIVE PRESSURE TO PUSH AIR INTO LUNGS**

↳ Compared to normal breathing in which negative pressure is used to **inhale** oxygen into lungs



## INDICATIONS:

→Unable to protect airway
- Under anesthesia for surgery
- Brain injury or stroke

→Severely impaired gas exchange
- Pneumonia or COPD
- ARDS

Anything that causes
**IMPAIRED GAS EXCHANGE** or
**COMPROMISED AIRWAY**

## VENTILATOR SETTINGS

### TIDAL VOLUME

Volume of air that is delivered with each breath

### FIO2 (FRACTION OF INSPIRED OXYGEN)

Oxygen concentration of air being delivered to patient

### PEEP (POSITIVE END EXPIRATORY PRESSURE)

Pressure applied at the end of each expiration

**PREVENTS ALVEOLAR COLLAPSE**

### FREQUENCY (RATE)

Number of breaths per minute delivered to patient

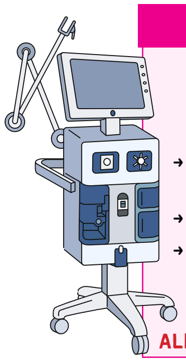
### I:E RATIO

Proportion of time set for **I**nspiration & **E**xpiration

### PRESSURE SUPPORT

Push of air to assist patient with spontaneous breath

## VENTILATOR MODES (MOST COMMON)



### AC

**A**SSIST **C**ONTROL

Used for patients that require **full ventilator support**

- →Delivers preset volume & number of mandatory breaths
- →Patient can trigger breaths
- →Breaths patient triggers will deliver a set volume

**CAN LEAD TO RESPIRATORY ALKALOSIS IF PATIENT IS TACHYPNEIC**

### SIMV

**S**YNCHRONIZED **I**NTERMITTENT **M**ANDATORY **V**ENTILATION

WEANING MODE

Used for patients that require **partial ventilator support**

- →Delivers preset volume & number of mandatory breaths
- →Allows patient to take spontaneous breaths in between preset breaths
- →Patient controls tidal volume on spontaneous breaths

### CPAP

**C**ONTINUOUS **P**OSITIVE **A**IRWAY **P**RESSURE

WEANING MODE

Used for patients that require **minimal ventilator support**

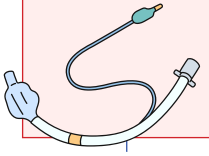
- →**NO** mandatory breaths are given
- →Provides constant positive pressure at preset number
- →Commonly used to assess if patient is ready for extubation

**MUST BE ABLE TO TAKE OWN BREATHS!**

**MOST SUPPORTIVE** ⟷ **LEAST SUPPORTIVE**

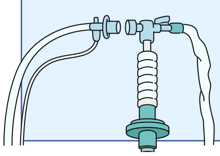
## PRESSURE ALARMS

### HIGH PRESSURE



- Kink in tubing
- Secretions blocking airway
- Coughing, gagging, or "fighting" the ventilator
- Pulmonary edema or pneumothorax

### LOW PRESSURE



- Disconnection from circuit
- Air leak around cuff
- Break/ open valve in tubing
- Self- extubation

## NURSING INTERVENTIONS

- → Keep bag-valve mask at bedside at all times
- → 100% oxygen before and after suctioning
- → Always suction out, not in
- → Suction only when needed to avoid lung injury
- → Bowel regimen to prevent constipation
  (lack of movement + sedation= decreased motility)

### VAP BUNDLE

Evidence- based interventions to prevent Ventilator Associated Pneumonia

- ⋆Keep HOB >30 degrees
- ⋆Oral care with chlorhexidine
- ⋆Stress ulcer prophylaxis
- ⋆Daily "sedation vacation"
- ⋆DVT prophylaxis
- ⋆Q2 Turning

# CRRT (CONTINUOUS RENAL REPLACEMENT THERAPY)

## WHAT IS IT?

**Non-stop 24-hour slow dialysis** therapy used on critically ill patients (method is slower to allow solute & fluid homeostasis)

Indicated for **hemodynamically unstable patients** who cannot tolerate faster fluid & electrolyte shifts like in traditional dialysis

## CRRT MODES

### SCUF (SLOW CONTINUOUS ULTRAFILTRATION)

- →Uses ultrafiltration to remove excess fluid
- →Little to no solute clearance
- →Fluid is not replaced

**INDICATION:** Patients with fluid overload

### CVVH (CONTINUOUS VENOVENOUS HEMOFILTRATION)

- →Uses **ultrafiltration & convection** to remove excess fluid & solutes
- →Small & large molecules are impacted
- →Must replace fluid

**INDICATION:** For uremia & severe acid-base or electrolyte imbalances

### CVVHD (CONTINUOUS VENOVENOUS HEMODIALYSIS)

- →Uses **diffusion** to remove waste products & solutes
- →Small & medium size molecules are impacted
- →Uses dialysate but no replacement fluid

**INDICATION:** For uremia & severe acid-base or electrolyte imbalances

### CVVHDF (CONTINUOUS VENOVENOUS HEMODIAFILTRATION)

- →Uses **diffusion, ultrafiltration & convection** to remove waste, solutes & fluid
- →Small, medium & large molecules are impacted
- →Uses dialysate & replacement fluid

**INDICATION:** Acid-base/ electrolyte imbalances, uremia & fluid removal

## ACCESS

Well functioning venous access is **VITAL** for CRRT!

**RIGHT IJ MOST PREFERRED SITE**

Due to proximity to right atrium

**FEMORAL:** ↑ risk of infection
**SUBCLAVIAN:** ↑ risk of stenosis

## TERMS

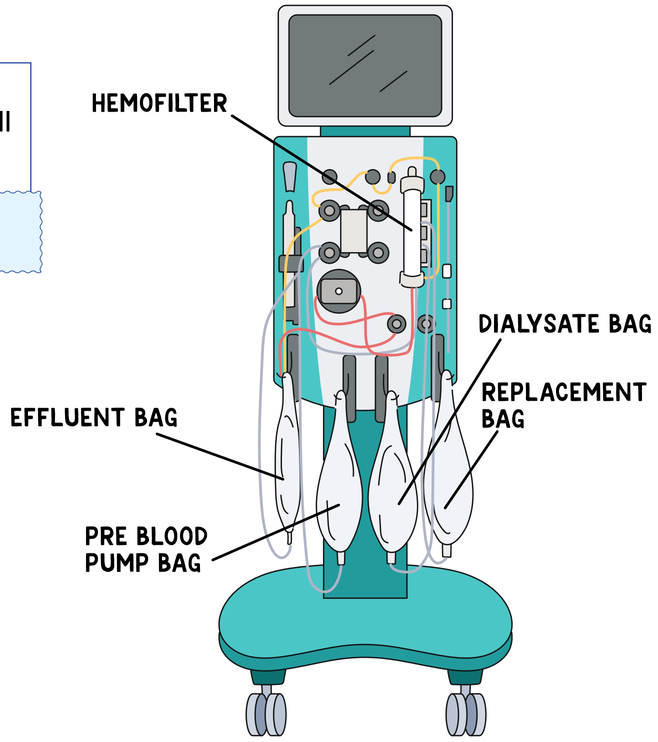
**DIALYSATE:** solution used to promote solute removal via diffusion

**EFFLUENT:** dialysate solution after diffusion has occured

**REPLACEMENT SOLUTION:** fluid containing electrolytes & buffers (given in CVVH & CVVHDF)

**TRANSMEMBRANE PRESSURE (TMP):** pressure exerted on membrane during CRRT (filter "clogging" ↑ TMP)

**PRESSURE DROP:** pressure measurement in hollow fibers (clotting ↑ PD)



## PRINCIPLES

**DIFFUSION:** Movement of **solutes** through a semipermeable membrane from high to low concentration

**IN CRRT:** **Blood** flows in one direction on one side of the membrane, & **dialysate** flows in the opposite direction on the other side

**ULTRAFILTRATION:** Movement of **fluid** through a semipermeable membrane due to pressure gradient

**PRESSURE GRADIENT CAN BE CREATED BY:**

① Positive pressure on blood side (pushing blood through filter)
② Negative pressure via effluent pump (pulling blood)

**CONVECTION:** One-way movement of solutes through a semipermeable membrane with fluid

**IN CRRT:** Requires a large amount of fluid in order to remove a sufficient amount of solutes, so fluid replacement is needed

**ADSORPTION:** Adherence of solutes to molecular inner surface of membrane

**IN CRRT:** Solutes stick to membrane, eventually causing it to "clog" & filter becomes less effective

**HEPARIN** is often added to the blood during CRRT to prevent clotting & extend filter life

Decided based on risk vs. benefit based on the clinical status & risk factors of the patient

# SHOCK OVERVIEW

**WHAT IS SHOCK?** Circulatory failure due to hypoperfusion that leads to **inadequate oxygenation in cells & tissues**

## STAGES OF SHOCK

### ① INITIAL STAGE

- → Cardiac output is ↓ enough to cause tissue hypoxia
- → Cells go from aerobic to anaerobic causing **LACTIC ACIDOSIS**

NORMAL LACTATE <1 MMOL/ L

LACTIC ACIDOSIS >4 MMOL/ L

### ② COMPENSATED

SNS shunts blood to vital organs through vasoconstriction & microcirculation of vessels

**↑ perfusion to heart & brain**

- ▸↑ HR
- ▸↑ BP

**↓ perfusion to GI, skin & lungs**

- ▸↓ GI motility
- ▸↓ urine output
- ▸Cold & clammy skin
- ▸↑ RR

### ③ PROGRESSIVE

Body's rescue attempt has failed and unable to compensate

**↓ perfusion to all vital & non-vital organs**

- ▸Severely altered LOC
- ▸↑ RR ↓ O2 (will require intubation)
- ▸↓ BP, arrhythmias
- ▸↓ temp
- ▸↑ risk of GI ulcers
- ▸↑ risk of bleeding (DIC may develop)

### ④ REFRACTORY

Terminal phase of shock

**IRREVERSIBLE**

- → Absent compensatory mechanisms
- → Organs continue to shut down
- → Death is inevitable
  - **NO CURE**

## TYPES OF SHOCK

| HYPOVOLEMIC SHOCK | CARDIOGENIC SHOCK | OBSTRUCTIVE SHOCK |
|---|---|---|
| Due to **insufficient circulating blood volume** | Due to insufficient **cardiac output** | **Mechanical obstruction** blocks heart from filling or pumping adequately |

### DISTRIBUTIVE SHOCKS

Abnormal distribution of blood to tissues & organs

ALL THREE TYPES RESULT IN **VASODILATION**

| SEPTIC SHOCK | ANAPHYLACTIC SHOCK | NEUROGENIC SHOCK |
|---|---|---|
| Systemic inflammatory response due to an **infectious** source | Severe reaction to **allergen** that causes release of histamines | **CNS damage** leading to loss of communication between SNS & blood vessels it controls |

## NURSING INTERVENTIONS (FOR ALL SHOCKS)

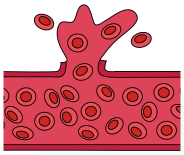
**GOAL OF TREATMENT:**
① Find & treat underlying cause
② Ensure organs are getting adequate perfusion
③ Prevent further decompensation

- → Continuous monitoring of VS & ECG
- → Frequents labs
  - ▸Lactic acid
  - ▸CBC & coags
  - ▸BMP & LFT
  - ▸Cardiac enzymes
  - ▸ABG
  - ▸Blood cultures
- → Strict I&O
- → Anticipate placement of invasive lines/ devices
  - ▸Central line
  - ▸Arterial line
  - ▸PAC
  - ▸Foley Catheter
  - ▸ETT
  - ▸NG or OG Tube
- → Anticipate intubation

# TYPES OF SHOCK

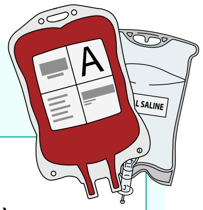
## HYPOVOLEMIC vs. CARDIOGENIC vs. OBSTRUCTIVE

**IN ALL 3 TYPES:** ↓CO ↓BP ↓O2 ↓UO ↑SVR ↑HR



## HYPOVOLEMIC

Decreased intravascular blood volume



### CAUSES

**HEMORRHAGIC**

▸Trauma
▸GI bleed
▸Postpartum hemorrhage

**NON-HEMORRHAGIC (FLUID VOLUME LOSS)**

▸Burns
▸Severe dehydration
▸Diabetes insipidus
▸Severe vomiting/ diarrhea

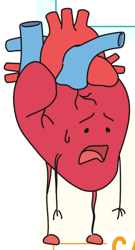
### SYMPTOMS

→ Dyspnea
→ Pale and cool skin
→ Altered LOC
→ Tachypnea
→ Weak, thready pulse

### TREATMENT

→ **REPLACE VOLUME!**
  ▸Crystalloids (NS or LR)
  ▸Colloids (Albumin)
  ▸Blood products
    **WILL NEED AT LEAST 2 GOOD LARGE BORE IV'S**

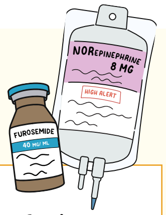
→ Administer oxygen
→ Replace electrolytes



## CARDIOGENIC

Heart fails to **pump correctly** leading to decreased perfusion to body

**THERE'S ENOUGH BLOOD VOLUME; THE HEART JUST ISN'T PUMPING IT EFFICIENTLY**



### CAUSES

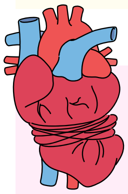
→ Heart failure
→ Myocardial infarction
→ Myocarditis
→ Cardiomyopathy
→ Dysrhythmias
→ Pulmonary embolism

### SYMPTOMS

→ Dyspnea
→ Pale and cool skin
→ Altered LOC
→ Tachypnea
→ JVD
→ Crackles

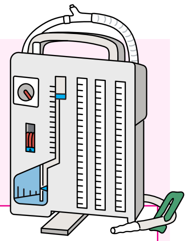
### TREATMENT

→ **Vasopressors:** cause vasoconstriction to ↑ perfusion
→ **Vasodilators:** ↓ preload & afterload to ↑ cardiac output
→ **Diuretics:** ↓ fluid build-up
→ **+ Inotropes (Dobutamine):** improve contractility
→ **Intra-Aortic Balloon Pump:** ↑ cardiac output



## OBSTRUCTIVE

**Mechanical obstruction** blocks heart from filling or pumping properly



### CAUSES

→ Tension pneumothorax
→ Pulmonary embolism
→ Cardiac tamponade
→ Vena cava syndrome
→ Severe pulmonary hypertension
→ Restrictive cardiomyopathy
→ Pericarditis

### SYMPTOMS

→ Dyspnea
→ Pale and cool skin
→ Altered LOC
→ Tachypnea
→ JVD
→ Chest pain

### TREATMENT

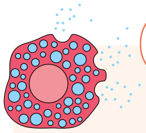
→ **TREAT THE UNDERLYING CAUSE!**
  ▸**Tension pneumo:** needle decompression & chest tube
  ▸**Cardiac Tamponade:** pericardiocentesis
  ▸PE: heparin/ thrombolytics

→ **VOLUME RESUSCITATION**
(Colloids, crystalloids & blood products)

# TYPES OF SHOCK

## ANAPHYLACTIC vs. SEPTIC vs. NEUROGENIC

**ALL 3 ARE DISTRIBUTIVE SHOCKS:** A classification of shocks that causes **vasodilation** leading to inadequate tissue perfusion



## ANAPHYLACTIC

Extreme **histamine response** due to allergen introduced to body

Causes vasoDILATION & bronchoCONSTRICTION

### CAUSES

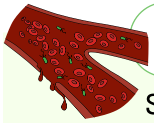
- → Food allergy
  - ▸Nuts
  - ▸Dairy
  - ▸Shellfish
- → Medication allergy
- → Insect bites/ sting
- → Latex allergy
- → Contrast dye allergy

### SYMPTOMS

- → ↓ BP ↑ HR ↓ O2
- → ↓ CO ↓ SVR
- → Itching & hives
- → Flushed or pale skin
- → Wheezing & dyspnea
- → Swollen tongue or throat
- → Nausea/ vomiting/ diarrhea

### TREATMENT

- → Remove causative allergen
- ★ Epinephrine **1ST LINE DRUG**
  - ↳causes vasoCONSTRICTION & bronchoDILATION
- → Oxygen & maintain airway (severe swelling may cause need for emergent tracheostomy!)
- → Medications
  - ▸Antihistamines: ↓ immune response
  - ▸Albuterol: open airways
  - ▸Corticosteroids: ↓ inflammation
  - ▸ IV fluids



## SEPTIC

Systemic response to infection

**SEPTIC SHOCK=END STAGE OF SEPSIS**

**3 MAIN ISSUES:**

①Vasodilation causes pooling & ↓ tissue perfusion
②Leaky blood vessels cause ↓ blood volume
③Clot formation blocks blood flow to tissues

### CAUSES

- → Indwelling devices
  - ▸Central lines
  - ▸Foley catheter
  - ▸ETT/ trach
- → Infection
  - ▸Urinary tract infection
  - ▸Wounds
  - ▸Pneumonia
- → Invasive procedures
- → Immunocompromised

### SYMPTOMS

**EARLY STAGE**

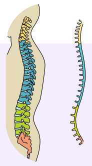
- ▸↑ BP ↑ HR ↑ RR
- ▸↑ CO ↓ SVR
- ▸Warm & flushed skin
- ▸Hyperthermia

**LATE STAGE**

- ▸↓ BP ↑ HR ↓ O2
- ▸↓ CO ↑ SVR
- ▸Cool & clammy skin
- ▸↓ urine output
- ▸Altered LOC/ Coma

### TREATMENT

- → Broad spectrum antibiotics
  - ↳draw blood cultures first but do not delay treatment!
- → ↑ tissue perfusion
  - ▸ IV fluids **FIRST**
  - ▸ Vasopressors if fluids ineffective
- → Prevent stress ulcers (early nutrition, H2 blockers & PPI's)
- → Monitor lactate levels



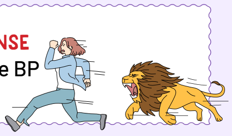
## NEUROGENIC

Loss of communication between sympathetic nervous system & blood vessels it controls

**REMEMBER:**

**SYMPATHETIC NERVOUS SYSTEM= FIGHT OR FLIGHT RESPONSE**
↳ Controls vasomotor tone of blood vessels that manage BP

**LOSS OF VASOMOTOR TONE= ↓ BP**



### CAUSES

- → Spinal cord injury/ trauma (above T6)
  - ▸Motor vehicle accident
  - ▸Fall
  - ▸High impact sports
- → Spinal anesthesia
- → CNS damage
  - ▸Meningitis
  - ▸Cerebral ischemia
  - ▸Guillain-Barre syndrome

### SYMPTOMS

- → ↓ BP ↓ HR
- → ↓ CO ↓ SVR
- → Warm, dry extremities & cold body
- → ↓ urine output
- → Altered LOC/ coma
- → Hypothermia

### TREATMENT

- → **KEEP SPINE IMMOBILIZED**
- → ↑ tissue perfusion
  - ▸IV fluids **FIRST** → **WATCH FOR FLUID OVERLOAD!**
  - ▸Vasopressors if fluids ineffective
- → Atropine for bradycardia
- → Maintain airway
- → DVT prophylaxis (blood is pooling)
  - ▸SCD's
  - ▸Anticoagulants
  - ▸ROM exercises

# SEPSIS

**WHAT IS SEPSIS?** Severe & **systemic** response to an infection that can lead to ↓ tissue perfusion & organ damage

## RECOGNIZING SEPSIS

**T EMPERATURE**
Higher or lower than normal

**I INFECTION**
Signs of infection

**M ENTAL DECLINE**
New confusion or lethargy

**E XTREMELY ILL**
Severe pain/ discomfort/ dyspnea

## SEPSIS CONTINUUM

### STAGE 1: SIRS

**SYSTEMIC INFLAMMATORY RESPONSE SYNDROME**

**SIRS CRITERIA:**

ANY 2+ SYMPTOMS

- → Temp >100.4 F or <96.8F
- → RR >20
- → HR >90
- → WBC >12,000 or <4,000

### STAGE 2: SEPSIS

Two or more signs of **SIRS** +
**CONFIRMED OR SUSPECTED INFECTION**

### STAGE 3: SEVERE SEPSIS

**SEPSIS** + organ dysfunction (1+ symptoms):

- → ↓ urine output
- → Altered LOC
- → Arrhythmias
- → Extreme weakness
- → Dyspnea
- → ↓ platelets

### STAGE 4: MODS

**MULTIPLE ORGAN DYSFUNCTION SYNDROME**

**SEVERE SEPSIS** + **multiple organ system failure**

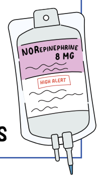
- → Hypotension (MAP <65) after fluids
- → Lactate >4 after fluids
- → Respiratory failure
- → AMS (change from baseline)

## SEPSIS BUNDLE

Must be completed within
**6 HOURS** of identifying sepsis

ANAEROBIC
AEROBIC

1. Draw serum lactate
2. Obtain blood cultures **BEFORE** giving antibiotics
3. **Administer broad-spectrum antibiotics** within 1 hour of admission (once cultures come back will change to more targeted antibiotics)
4. **Administer fluids** if hypotensive or serum lactate >4 mmol/L
   INITIAL CRYSTALLOID 30 ML/ KG → NORMAL SALINE
5. **Maintain/ improve blood pressure** For persistent hypotension despite fluid resuscitation or lactate >4 mmol/L
   ADMINISTER VASOPRESSORS TO KEEP MAP >65
   → NOREPINEPHRINE IS THE 1ST LINE PRESSOR FOR SEPSIS



## NURSING INTERVENTIONS

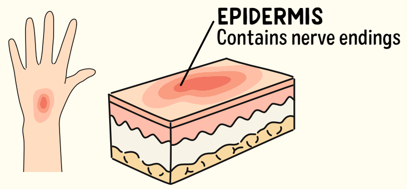
- → Monitor
  - ▸ VS, MAP & ECG
  - ▸ Hemodynamic monitoring
  - ▸ **Lactate level:** goal <2 mmol/ L
  - ▸ Strict I&O
  - ▸ **Labs:** CBC, BMP, LFT, Coags, ABG
  - ▸ **Blood glucose:** goal < 180 mg/dL
  - ▸ Airway & respiratory effort
- → DVT prophylaxis
  - ▸ SCD's
  - ▸ Anticoagulation

# BURNS OVERVIEW

A **BURN** is damage caused to the skin due to an external factor causing tissue breakdown

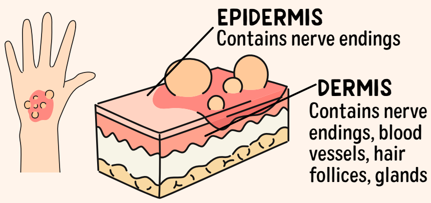
## CLASSIFICATIONS of BURNS

### 1ST DEGREE SUPERFICIAL


EPIDERMIS
Contains nerve endings

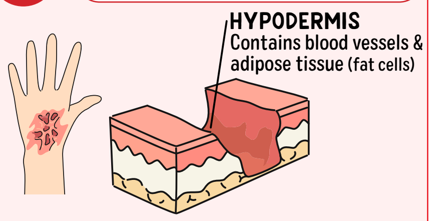
- Affects epidermis only
- Pink/red & dry skin
- Tenderness or pain
- Blanching present
- No blisters or scarring

### 2ND DEGREE PARTIAL THICKNESS


EPIDERMIS
Contains nerve endings
DERMIS
Contains nerve endings, blood vessels, hair follices, glands

- Affects epidermis & dermis
- Red, blistered & moist skin
- Painful
- Blanching present
- Shiny scars left behind

### 3RD DEGREE FULL THICKNESS


HYPODERMIS
Contains blood vessels & adipose tissue (fat cells)

- Affects epidermis, dermis & hypodermis
- May look black/red/ yellow & hard
- Charred, dry, leathery skin (eschar)
- Little to no pain (nerve damage)
- Skin won't heal (will need skin grafting)

**ESCHAR MUST BE REMOVED!**

## TYPES of BURNS

### THERMAL

From external heat source

**EXAMPLES:**
- Hot surfaces
- Steam or liquids
- Fire

### CHEMICAL

From contact with toxic agent

**EXAMPLES:**
- Bleach
- Gases
- Drain cleaner

**ALKALI BURNS** are harder to treat because they aren't neutralized by the skin like acid burns

### ELECTRIC

From electrical current

**EXAMPLES:**
- Power lines
- Outlets
- Lightning

can also cause **DYSRHYTHMIAS & KIDNEY INJURY** if severe

### RADIATION

From radiation exposure

**EXAMPLES:**
- Sun
- Radiation therapy
- Excessive x-rays

### COLD

From overexposure to cold temperatures

**EXAMPLE:**
- Frostbite

### FRICTION

From skin being scraped off forcibly by object

**EXAMPLE:**
- Rug burn
- Rope burn

## BURN LOCATION COMPLICATIONS

| RESPIRATORY ISSUES | COMPARTMENT SYNDROME | DISABILITY | INFECTION | IMPAIRED HEALING |
|---|---|---|---|---|
| → Head<br>→ Neck<br>→ Chest<br>→ Torso | → Arms<br>→ Legs<br>**ESCHAR** creates a tourniquet-like effect that can cut off circulation | → Hands<br>→ Feet<br>→ Joints<br>→ Eyes | → Perineal<br>→ Perianal<br>→ Eyes<br>→ Ears | → Diabetes<br>→ CKD<br>→ Malnourished |

**OPEN AREAS ALLOW BACTERIA TO GET IN EASILY**

# BURN CARE PHASES

## EMERGENT

AKA **RESUSCITATIVE PHASE**

**LASTS 24–48 HOURS**

Onset of injury up until capillary integrity restored

### PATHO:

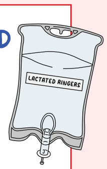
↑ capillary permeability (leaky blood vessels) causes edema & **fluid volume defecit**

PATIENT IS HIGH RISK FOR **HYPOVOLEMIC SHOCK**

### SYMPTOMS:

- ↑ HR ↓BP ↓CO
- ↑ HCT
- ↑ BUN/CR
- ↓urine output
- ↑ K+ ↓Na
- ↓WBC

### PRIORITIES



- **Fluid resuscitation** (see parkland formula below) — **LACTATED RINGERS**
- Establish IV access (need at least 2 good IV's/ CVC)
- Strict I & O (foley catheter)
- Closely monitor VS, EKG & electrolytes

## ACUTE

**48–72 HOURS AFTER BURN** until wound closes

Onset of diuresis up until wound closure

### PATHO:

Capillary permeability is restored & **causes diuresis**

**PRIMARY FOCUS:**

① Infection prevention
② Pain management
③ Nutrition
④ Wound care

### PRIORITIES

- **Infection prevention**
  - Clean bed sheets
  - Monitor temps
  - Broad spec. antibiotics
- **Monitor electrolytes**
  - Especially Na, K+ & glucose (↑ risk due to fluid shifts)
- **Adequate nutrition**
  - Monitor bowel sounds (risk of ileus & ulcers)
  - Diet ↑ protein & calories (when BS present)
- **Wound care**
  - Premedicate before wound care
  - Debridement or grafting

## REHABILITATIVE

**CAN LAST WEEKS–YEARS**

From wound closure to optimal state of functioning

### PRIORITIES

- **Prevent scars & contractures**
  - ROM
  - PT & OT
  - Avoid direct sun for at least 3 months
- **Psychosocial support**
  - Encourage ADL's
  - Cosmetic consults

## FLUID RESUSCITATION

In the **EMERGENT/ RESUSCITATIVE PHASE**, fluid replacement is top priority & calculated using formulas for patient's specific needs

### PARKLAND FORMULA

Used to calculate total fluid patient requires for first 24 hours after burn injury

**APPLIES TO 2ND & 3RD DEGREE BURNS ONLY**

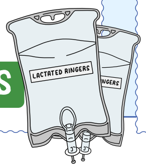
**FORMULA:**

**4ML X BODY WEIGHT (KG) X TBSA %**

Give first half over **FIRST 8 HOURS**

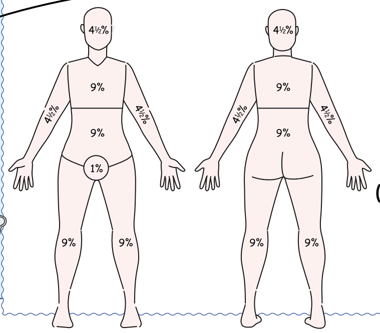
Give second half over **NEXT 16 HOURS**

MOST COMMON FLUID USED: **LACTATED RINGERS**



### RULE OF 9's

Used to estimate total body surface area **(TBSA %)** that is burned



**NOTE:** Areas like head & arms are worth 4.5% **each**, making the **FULL** area (front & back) worth 9%

# TRAUMA & EMERGENCY CARE

## PRIMARY SURVEY ABCDE

### AIRWAY

**ASSESS FOR:**

- →Obstruction/ foreign bodies
- →Secretions + bleeding
- →Head, neck & spine

**INTERVENTIONS**

- →Remove foreign bodies
- →Suctioning
- →Intubation
- →Chin-lift/ jaw-thrust
- →Administer oxygen
- →Monitor O2 with pulse ox

### BREATHING

**ASSESS FOR:**

- →Lung sounds
- →Tracheal deviation
- →Chest rise
- →Work of breathing

**INTERVENTIONS**

**DEPENDS ON CAUSE:**

- →Ventilate with bag-valve mask if ↓ RR
- →Chest tube if pneumo
- →Positive pressure ventilation if flail chest

### CIRCULATION

**ASSESS FOR:**

- →Pulses
- →Bleeding
- →Skin color & temp
- →Cap refill
- →Blood pressure

**INTERVENTIONS**

- →Apply direct pressure on bleeding sites
- →Administer IV fluids & blood products
- →CPR if no pulse

### DISABILITY

**ASSESS FOR:**

- →PERRLA & AVPU
- →GCS
- →Blood glucose (R/O hypoglycemia)

**INTERVENTIONS**

- →Frequently reassess neuro status for changes
- →Intubation if unconscious & unable to protect airway
- →CT scan to assess for head trauma/ injury

### EXPOSURE

**ASSESS FOR:**

- →Wounds
- →Injuries
- →Deformities

**INTERVENTIONS**

- →Remove all clothing for full assessment
- →Cover with warm blankets to prevent hypothermia
- →Maintain privacy throughout

## SECONDARY SURVEY FGHI

### FULL SET OF VITALS

**NOTE ANY CHANGES IN:**

- → BP
- → HR
- → RR
- → Temp
- → O2 sat
- → Weight
- → PERRLA
- → LOC

### GIVE COMFORT

Continue to reassure and allow patient to rest

### HISTORY & HEAD-TO-TOE

Conduct health history using **SAMPLE** & do **HEAD-TO-TOE**

- **S SIGNS & SYMPTOMS:** what brought them in today?
- **A ALLERGIES:** what are they allergic to?
- **M MEDICATIONS:** what medications do they take?
- **P PAST HEALTH HISTORY:** what medical conditions/ procedures have they had?
- **L LAST MEAL:** when was the last time they had any oral intake?
- **E EVENTS:** how did this occur?

### INSPECT POSTERIOR SURFACE

Check back, sacrum, and pressure points for any signs of breakdown

## EMERGENCY SEVERITY INDEX

### LEVEL 1 / RESUSCITATION / ESI 1

Requires **immediate** life-saving intervention

**UNSTABLE** ⚠

MUST BE SEEN IMMEDIATELY!

**CASES:**

- ▸Cardiac arrest
- ▸Prolonged seizure
- ▸Shock

### LEVEL 2 / EMERGENT / ESI 2

Emergent & time sensitive

**Must be seen within 10 MINUTES**

**CASES:**

- ▸Stridor
- ▸Chest pain
- ▸Stroke

### LEVEL 3 / URGENT / ESI 3

Potentially life threatening, stable

**Must be seen within 1 HOUR**

**CASES:**

- ▸Vomiting
- ▸Abdominal pain
- ▸Hip fracture

### LEVEL 4 / LESS URGENT / ESI 4

Potentially serious condition

**CAN BE DELAYED**

**CASES:**

- ▸Back pain
- ▸Cystitis
- ▸Rash

### LEVEL 5 / NON URGENT / ESI 5

No resources required

**CAN BE DELAYED**

**CASES:**

- ▸Vaccination
- ▸Sore throat
- ▸Prescription refill

# DISASTER TRIAGE

**WHAT IS DISASTER TRIAGE?** Prioritizing patient care in emergency situations
→ level of care depends on the severity of patient's condition

**GOAL:** improve outcomes for greatest number of casualties

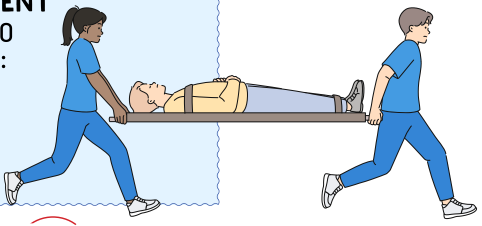
## START METHOD

### SIMPLE TRIAGE AND RAPID TREATMENT

Allows triage of patients in less than 30 seconds based on three observations:

CHECK IN THIS ORDER!

① BREATHING
② CIRCULATION
③ MENTAL STATUS



## RED → IMMEDIATE

SEEN 1ST

Injuries are life threatening but could possibly survive if treated immediately

**COMPROMISE IN ABC'S**

- → Unconscious & unable to protect airway
- → RR >30
- → No radial pulse

**EXAMPLES:**

- Spinal cord injury
- Major burns
- Severe bleeding
- Shock
- Altered LOC
- Respiratory trauma (pneumo)

## YELLOW → DELAYED

SEEN 2ND

Significant injuries but ABC's are currently stable; treatment can be delayed (1 hour) without significant risk of mortality

**EXAMPLES:**
- Severe, open fractures
- Open wounds

## GREEN → MINOR

"WALKING WOUNDED"

Minimal injuries that are not life-threatening; patient can get up and move

**EXAMPLES:**
- Sprained wrist
- Laceration

## BLACK → DECEASED

DEAD OR DYING

Injuries are severe to the point that patient will not survive

**EXAMPLES:**
- Absent ABC's
- Deteriorated mental status

## ASSESSMENT

**IS THE PATIENT WALKING?**
Yes→ GREEN TAG

**IF UNABLE TO WALK** →

### ① ARE THEY BREATHING?

✓ YES
RR >30→ RED TAG
RR <30→ Check CIRCULATION

✗ NO
Reposition airway
-RR→ BLACK TAG
+RR→ RED TAG

### ② IS THERE CIRCULATION?

✓ RADIAL PULSE PRESENT
→ Check MENTAL STATUS

✗ RADIAL PULSE ABSENT
RED TAG

### ③ WHAT'S THEIR MENTAL STATUS?

✓ CAN OBEY COMMANDS
YELLOW TAG

✗ CANNOT OBEY COMMANDS
RED TAG

# DRUG OVERDOSE & POISONING

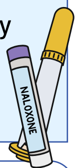
## OPIOID OVERDOSE

### SYMPTOMS:

- ↓ HR ↓ BP ↓ RR
- Pinpoint pupils
- Snoring or gurgling sounds
- Unresponsiveness
- Pallor or cyanosis

### TREATMENT:

- **ANTIDOTE: NALOXONE**
- Intubation to protect airway
- Fluids & pressors to ↑ BP
- Methadone for withdrawal



## ACETAMINOPHEN OVERDOSE

### SYMPTOMS:

→ Signs of acute liver failure
  - Abdominal pain
  - Confusion
  - Jaundice
  - Generalized weakness

### TREATMENT:

- **ANTIDOTE: N-ACETYLCYSTEINE**
- **Activated charcoal:** to prevent from absorbing into GI tract

## ALCOHOL OVERDOSE

### SYMPTOMS:

- ↓ HR ↓ RR ↓T
- Confusion or unconsciousness
- Seizures
- Cold & clammy skin

### TREATMENT:

- Protect airway (↑ risk for aspiration)
- B vitamins
- Benzodiazepines for withdrawal

## BENZODIAZEPINE OVERDOSE

### SYMPTOMS:

- CNS depression with normal VS
- Temporary memory loss
- Larger doses can cause coma or ↓ RR

### TREATMENT:

- **ANTIDOTE: FLUMAZENIL**
- Assisted ventilation

## STIMULANT OVERDOSE

### SYMPTOMS:

- ↑ HR ↑BP ↑RR
- Dilated pupils
- Hyperalertness & sweating
- Chest pain

### TREATMENT:

- **ANTIDOTE: AMMONIUM CHLORIDE** (for amphetamines)
- Seizure precautions
- Benzodiazepines & anti-hypertensives

## EDUCATION/ PREVENTION

- ⋆ Avoid mixing alcohol and other drugs
- ⋆ Educate on signs of overdose
- ⋆ Substance abuse counseling
- ⋆ Don't store medications no longer needed
- ⋆ Take prescriptions only as prescribed
- ⋆ Never dissolve, crush, or chew medications unless directed in instructions
- ⋆ Only take drug dose as prescribed

## MANAGEMENT of POISONING

| ASSESS ABC'S | IDENTIFY TYPE & AMOUNT OF SUBSTANCE INGESTED IF POSSIBLE | HISTORY & ASSESSMENT | REDUCE ABSORPTION |
|---|---|---|---|
| ▸ Airway<br>▸ Breathing<br>▸ Circulation | Can help determine required antidote | Assess for damage to tissues & organs | ▸ Gastric lavage<br>▸ Activated charcoal<br>▸ Specific antidotes<br>▸ Dialysis |

**MUST REPORT CASE TO LOCAL POISON CONTROL CENTER**

**DO NOT INDUCE VOMITING WITH CORROSIVE CHEMICALS & AGENTS**

## ACCIDENTAL OVERDOSE

Due to incorrect use of medication without the intention of causing damage

**EXAMPLES:**

- Taking opiates to get "high" without intention of overdose
- Taking too much tylenol for a headache without reading the label

**VS.**

## INTENTIONAL OVERDOSE

Taking medication with the intention of causing harm to oneself

Could be cry for help or suicide attempt

**MUST INITIATE SUICIDE PRECAUTIONS**

## NURSING CARE

→ Listen to patient and show empathy
→ Work with social worker & team to coordinate care to detox facility
→ Monitor VS & EKG for complications
→ Initiate suicide precautions if deemed intentional overdose

## SUICIDE PRECAUTIONS

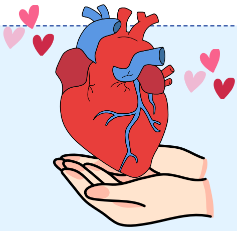
→1:1 sitter: patient must be kept within eyesight
→Provide emotional support
→Remove all object from room that can cause harm
  - Sharp objects
  - Medical supplies
  - Phone cords

# ORGAN DONATION

## RN'S ROLE IN ORGAN DONATION

When a patient's clinical status severely decompensates, it is the nurse's responsibility to refer them to the organ procurement organization who determines if the patient is a declared organ donor or not. If the patient is, the process of consultation begins.

## OPO ORGAN PROCUREMENT ORGANIZATION



Clinical team that coordinates organ procurement and donation process

- Work directly with medical facilities & receive referral triggers for possible donors
- Coordinate with specialized donor & transplant team
- Trained to communicate with family of the deceased

## REFERRAL TRIGGERS

The nurse must call within **1 hour** of all patient expirations or intubated patients that meet any of the following criteria:

- GCS 5 or less
- Absence of 2 or more neuro reflexes
  - No cough
  - No gag
  - No corneal response
  - No pupillary response
  - No pain response
- Grave prognosis (discussion of withdrawal of life support)

## WHAT CAN BE DONATED?

**There are different organs & tissues that can be donated to help recipients in need:**

- The 8 vital organs (heart, lungs, kidneys, pancreas, liver, intestines)
- Healthy heart valves
- Corneas from the eyes
- Skin grafts
- Bone, ligament & tendon grafts

## DONOR MANAGEMENT

Once the OPO has received consent for organ donation, the RN's role in goals of care changes

### PRIORITIES:

- **Hemodynamic stability**
  - Monitor BP, MAP, HR, ECG
- **Maintain normal lab parameters**
  - Frequent routine labs (per OPO protocol)
- **Family support**
  - Provide emotional support to family
  - Allow space in room for family to visit with patient

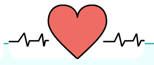
**MAINTAIN PRIVACY, RESPECT, & DIGNITY FOR THE PATIENT**

## FACTS ABOUT ORGAN DONATION

- ★ The RN refers the patient to the OPO
- ★ The OPO approaches the family, **not** the RN
- ★ Donation must be considered for any patient with confirmed brain death
- ★ Once organ donation consent is granted, procurement usually takes place within hours
- ★ The family is still able to have an open casket funeral after procurement
- ★ Being an organ donor does not affect the goals of care of a patient (goals of care are only changed when decision made by family)

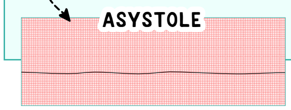
## DECLARATION of DEATH

### CARDIAC DEATH



Absence of heart contracting & pumping

- No vital signs
- Diagnostics
  - EKG
  - Pulse check
  - Heart & lung auscultation



Patient **must** be pronounced officially by MD by auscultation of heart & lungs after asystole

### BRAIN DEATH

Irreversible absence of all brain activity

- Positive VS, dependent on life support
- Diagnostics
  - **Nuclear brain scan:** will show absence of intracerebral perfusion
  - **Apnea test:** checks for absence of brainstem reflex

①Preoxygenate with 100% O2 for 10 minutes on ventilator

②Disconnect ventilator & assess for spontaneous respirations

③Asses for respiratory effort for 10 minutes

④If no respiratory effort observed after 10 mins, draw ABG

**NO RESPIRATORY EFFORT + CO2 >60= POSITIVE RESULT**

# MENTAL HEALTH

# MENTAL HEALTH OVERVIEW

## MENTAL HEALTH CONTINUUM

### HEALTHY

Normal, healthy functioning

- → Normal mood fluctuations
- → Sleeping well
- → Normal social activity
- → Physically well

### REACTING

Common & reversible distress

- → Trouble sleeping
- → Irritable
- → Overwhelm
- → Intrusive thoughts

### INJURED

Significant functional impairment

- → Poor sleep
- → Worthlessness
- → Withdrawn
- → Negative attitude

### ILL

Severe functional impairment

- → Depression
- → Excessive anxiety
- → Thought disturbances
- → Can't perform duties

**CLINICAL DISORDER**

### MENTAL HEALTH

Refers to the mental state and emotional well-being of a person

**CHARACTERISTICS:**

- ▸ Emotional stability
- ▸ Resilience
- ▸ Optimism
- ▸ Self-esteem

### MENTAL ILLNESS

Diagnosed condition that affects a person's thoughts and behaviors

**CHARACTERISTICS:**

**DISTURBANCE IN:**

- ▸ Cognition
- ▸ Emotional regulation
- ▸ Behavior

**SPECIFIC DIAGNOSIS USING DSM-5 CRITERIA**

### DSM-5

**DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS**

- ▸ Criteria used to identify mental disorders for adults & children
- ▸ Includes over 300 disorders
- ▸ Published by the American Psychiatric Association

## FACTORS AFFECTING MENTAL HEALTH

- → Past or childhood trauma
  - ▸ Domestic violence, neglect
- → Socioeconomic status
- → Drug or alcohol abuse
- → Grief or death of a loved one
- → Stress

- → Traumatic events
  - ▸ Violent crimes
  - ▸ War combat
  - ▸ Accidents
  - ▸ Abuse

- → Medical conditions
  - ▸ Head injuries
  - ▸ Neurological conditions
  - ▸ Stroke
  - ▸ Chronic illness
  - ▸ Neurotransmitter imbalance

## CULTURAL COMPETENCY

The ability to interact effectively with patients of different cultures, beliefs & behaviors

★ **MENTAL HEALTH SYMPTOMS LOOK DIFFERENT ACROSS DIFFERENT CULTURES**

### AWARENESS

Reflect on one's own beliefs and practices relating to healthcare

**ASK YOURSELF:**

- ☛ Who makes the healthcare decisions in your family?
- ☛ Does your culture talk about illness?
- ☛ What types of end-of-life customs do you have?

### KNOWLEDGE

Research information about your patient's cultures so you can better understand them

### ENCOUNTER

Encourages nurses to grow and improve their cultural competence by interacting with other cultures, backgrounds, and ethnicities

### SKILLS

Relates to the RN's ability to collect relevant data and utilize it to engage in effective cross-cultural interactions

### DESIRE

Requires a strong motivation to learn about other cultures as well as being open and accepting to different beliefs and perspectives

# MENTAL STATE EXAMINATION

The **MSE** is a structured evaluation to assess a patient's **behavioral and cognitive functioning**

## 1 APPEARANCE

Assess the overall **appearance** of the patient

### DEMOGRAPHICS

- → Age/race/gender/ ethnicity

### CLOTHING

- → Are they dressed appropriately for the weather/ occasion?

### POSTURE

- → Is their posture closed or open?

### GAIT

- → Are gait abnormalities present? (shuffling, hesitant, ataxic, etc.)

### GROOMING

- → Do they seem well-kept and groomed?

**NOTE ANY SIGNS OF NEGLECT**

## 2 BEHAVIOR

Assess the overall **behavior** of the patient

### ATTITUDE

- → Are they cooperative, suspicious, guarded, etc.

### FACIAL EXPRESSION

- → Do their facial expressions match what they are saying?

### EYE CONTACT

- → Do they avoid or give intense eye contact?

### PSYCHOMOTOR

- → Any signs of agitation?

### MOTOR ACTIVITY

- → Any tremors, tics, restlessness, involuntary movements?

## 3 SPEECH

Assess the overall **speech** of the patient

### QUALITY

- → Talkative or one word answers?

### VOLUME

- → Are they speaking very loudly (mania) or softly (depressive)?

### RATE

- → Are they speaking very fast/ slow?

### QUALITY

- → Slurred, clear, articulate, aphasic?

### SPONTANEITY

- → Are they able to stay on topic?

## 4 MOOD

Assess the overall **feelings** of the patient

### CONSISTENCY

- → Does their mood change throughout the conversation?

### OBJECTIVE

How *we* observe & describe their mood

- ▸ Irritable
- ▸ Depressed
- ▸ Elated
- ▸ Anxious
- ▸ Sad
- ▸ Apathetic

### SUBJECTIVE

How *they* observe & describe their mood

- ▸ "How are you feeling?"
- ▸ "How would you describe your mood?"

## 5 AFFECT

Assess the overall **expression** of the patient

- → Purely observational, do not ask questions to assess this
- → Assess the moment to moment expressions
  - ▸ Posture
  - ▸ Gestures
  - ▸ Facial expressions
  - ▸ Voice tonality

Mood & affect both relate to **EMOTION**, but are not the same thing

Affect is expressed **IMMEDIATELY**

Note if affect is **LABILE** as well as the **RANGE & INTENSITY**

## 6 THOUGHTS

Assess the overall **thought process & content** of the patient

### FORM

- → Is their thinking organized & linear?

### STREAM

- → Is their state of thinking flowing, or are they thought blocking?

### POSSESSION

- → Thought insertion/ broadcasting?

### CONTENT

- → Phobias, paranoia, violence, suicidal ideation→ Get 1:1 observation

## 7 PERCEPTION

Assess the overall **perception & sensation** of the patient and their environment

Are they having hallucinations? This could manifest as:

| AUDITORY | VISUAL | OLFACTORY | SOMATIC | GUSTATORY |
|---|---|---|---|---|
| HEARING | SIGHT | SMELL | TOUCH | TASTE |

## 8 COGNITION

Assess the **orientation, attention & memory** of the patient

- → Are they alert & oriented?
- → Do they have short-term or long-term memory loss?
- → Are they able to maintain attention?
- → Visual-spatial: can they read & write?

## 9 INSIGHT

Assess the patient's **ability to recognize their experiences**

- → Are they aware of their own illness or is there denial?
- → What is their understanding of their illness?

## 10 JUDGEMENT

Assess the patient's **ability to make good decisions**

- → Ensure proper communication to patient about illness
- → Assess if next of kin needs to be communicated with for decision making

# TYPES OF THERAPY

## PSYCHOANALYTIC THERAPY

### WHAT IS IT?

Talk therapy that explores how the unconscious mind influences thoughts, feelings and behaviors

### KEY CHARACTERISTICS

Allows the patient to explore their subconscious freely

### TECHNIQUES

- → Dream analysis
- → Free association
- → Transference

### EXAMPLE

Dissolving a patient's fear of dogs by revealing the fear developed because they were bit by a dog as a child

## PSYCHODYNAMIC THERAPY

### WHAT IS IT?

Focuses on gaining a deeper understanding of unconscious processes of the person that are represented in present behavior

### KEY CHARACTERISTICS

- → Examines unresolved past conflicts
- → Aims to change recurring thought patterns and learned defense mechanisms

### EXAMPLE

Connecting a patient's low self-esteem to a parent leaving them as a child

## INTERPERSONAL THERAPY

### WHAT IS IT?

Goal-oriented therapy that is split into phases to help patients develop strategies to apply to relationships and situations

### KEY CHARACTERISTICS

- → Time limited: number of sessions is determined before therapy starts
- → Mainly short-term (12-16 weeks)

### EXAMPLE

Patient feels depression after a breakup → therapist helps them mourn, process, and cultivate new skills to move forward

## RATIONAL EMOTIVE THERAPY

### WHAT IS IT?

Action-oriented techniques that help identify and reframe negative thoughts, ideas, and beliefs about oneself

### KEY CHARACTERISTICS

- Ⓐ Activating Event
- Ⓑ Belief about event
- Ⓒ Consequences of emotions/ behaviors

### EXAMPLE

Person feels like they did poorly during a work presentation and creates the belief **"I must be perfect, or I have no value at all"**

→ Replaces it with **"Making a mistake doesn't mean I'm worthless"**

## BEHAVIORAL THERAPY

### WHAT IS IT?

Goal of changing a behavior without focusing on the specific cause

### KEY CHARACTERISTICS

- → Based on the idea that behaviors are learned and can be changed
- → Encourages healthy ways to communicate and improve other aspects of life

### OPERANT CONDITIONING:

Encourages or discourages behavior by pairing it with a consequence

### CLASSICAL CONDITIONING:

Connects an involuntary response with a neutral stimulus

## COGNITIVE BEHAVIORAL THERAPY

### WHAT IS IT?

Aims to solve problems by challenging negative thoughts, behaviors, and perceptions about oneself and their environment

### KEY CHARACTERISTICS

- → Focuses on bringing awareness to current patterns & behaviors in order to change them
- → Develop more efficient coping skills to deal with challenging situations

### EXAMPLE

- → Exposing oneself to situations that are known to evoke anxiety
- → Journaling about thoughts & feelings throughout the day to increase awareness

## GROUP THERAPY

### WHAT IS IT?

Group of people gather and provide feedback and support to feelings and emotions with nurse or therapist acting as facilitator

### KEY CHARACTERISTICS

- → Nurse/ therapist has little input, does not act as leader of group
- → Members provide each other with support and practical help

### EXAMPLE

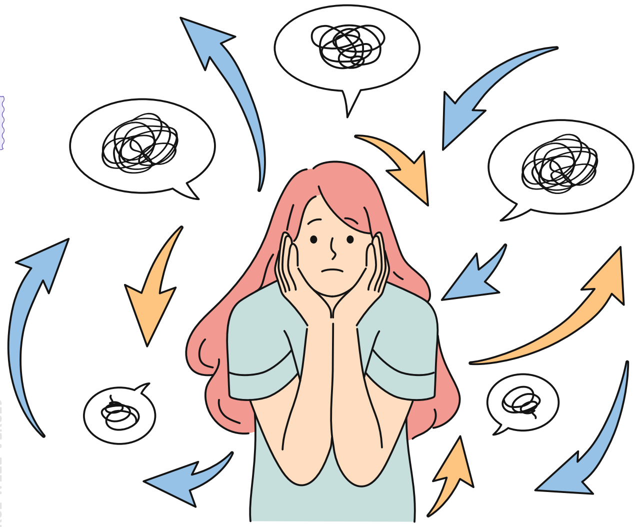
- → Alcoholics Anonymous
- → Bereavement groups

# ADHD (ATTENTION DEFICIT HYPERACTIVITY DISORDER)

## WHAT IS IT?

Developmental condition characterized by **inattention, impulsivity & hyperactivity**

**USUALLY DIAGNOSED IN CHILDHOOD**



## RISK FACTORS

Exact cause is **UNKNOWN**

- Genetics
- Toxin exposure
  - Lead
  - Secondhand smoke
- Chemical imbalance (↓ dopamine)
- Pregnancy-related
  - Substance abuse/drinking/smoking while pregnant
  - Poor nutrition during pregnancy

## SYMPTOMS

### INATTENTIVENESS

- Easily distracted
- Difficulty concentrating
- Failure to finish tasks

### IMPULSIVITY

- Short attention span
- Difficulty waiting one's turn
- Interrupting

### HYPERACTIVITY

- Fidgeting
- Excessive talking
- Inability to sit still

## TREATMENT

### MEDICATIONS

- **Stimulants: Ritalin**
  - May ↓ appetite & suppress growth in children
- **Amphetamines: Adderall**
  - ↑ risk for abuse & addiction
- **Atypical antidepressants: Bupropion**

### NON-PHARMACOLOGICAL THERAPY

- Avoid certain foods (may exacerbate symptoms):
  - High in preservatives
  - Containing food colorings
  - Simple sugars
- Intense exercise & activity
- Therapy
  - Cognitive behavioral therapy
  - Psychotherapy
  - Support groups
  - Social skills sessions

## DIAGNOSTICS

### DSM-5 CRITERIA FOR DX

| | |
|---|---|
| AGE UP TO 16 YEARS OLD | ≥6 symptoms for >6 months |
| DIAGNOSING AS ADULT | ≥5 symptoms for >6 months |

## NURSING INTERVENTIONS

### ACTIVITY

- Allow breaktime during activity
- Stick to a structured daily routine
- Limit distractions

### COMMUNICATION

- Give clear and simple instructions
- Break complex tasks into small steps
- Give positive feedback when meeting expectations

# AGGRESSION & ABUSE

## AGGRESSION

### SYMPTOMS

- → Pacing
- → Agitation
- → Fidgeting
- → Combative posture
- → Verbal threats

### TREATMENT

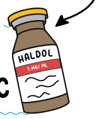
**DE-ESCALATION TECHNIQUES**

- → Calming voice
- → Allowing personal space
- → Redirection
- → Relaxation techniques
- → Decrease stimuli
- → Close observation
- → Remove any dangerous items from environment

**IF NOT SUCCESSFUL →**

- ▶ Haloperidol
- ▶ Lorazepam
- ▶ Restraints

**MONITOR EKG**
**HALDOL PROLONGS QTC**



**MUST GET ORDER WITHIN 1 HOUR OF APPLYING RESTRAINTS**

## ABUSE

### TYPES of ABUSE

| PHYSICAL | EMOTIONAL | SEXUAL | NEGLECT | ECONOMIC |
|---|---|---|---|---|
| Intentional use of physical force | Behaviors/ words intended to harm a person's self-worth or well-being | Forcing a person to engage in sexual acts without consent | Failure of caretaker to fulfill basic needs of a person | Forcing dependency of a person due to control of financial funds |

### RISK FACTORS

**ABUSER**

- → Poor education/ low IQ
- → Alcohol/ drug use
- → Low self-esteem
- → Family history of abuse

**VICTIM**

- → Women
- → Pregnancy
- → Unwanted/ unplanned children
- → Children with special needs
- → Chronic conditions (dementia)

**NURSES ARE REQUIRED BY LAW TO REPORT SUSPECTED ABUSE**

### CYCLE of ABUSE

**PHASE 1**
**TENSION BUILDING**

**ABUSER**

- →Judgemental
- →Unpredictable
- →Threatening
- →Provoking

**VICTIM**

- →Walking on eggshells
- →Reasoning with abuser failed

**PHASE 2**
**EXPLOSIVE**

**ABUSER**

Abuse occurs
(physical, emotional, sexual)

**VICTIM**

- →Attempts to protect self/ children
- →May or may not contact authorities

**PHASE 3**
**HONEYMOON**

**ABUSER**

- → Apologizes
- → Promises won't happen again
- → Gives gifts to victim

**VICTIM**

- →May drop charges
- →Forgives & believes won't happen again

# ANXIETY

Feeling of dread, apprehension, and/or uneasiness

## LEVELS of ANXIETY

### MILD ANXIETY

**HEALTHY & NORMAL**

Allows person to focus and problem solve

**SYMPTOMS**

Little to no physical S+S

- Nail biting
- Sighing
- Clenching jaw

### MODERATE ANXIETY

- Still able to problem solve but thinking is impaired
- Focuses on immediate concerns

**SYMPTOMS**

- Dry mouth
- Frequent urination
- Headaches
- Insomnia

### SEVERE ANXIETY

- Learning and problem solving not possible
- All behavior focused on relieving anxiety

**SYMPTOMS**

- Chest tightness
- Shortness of breath
- Digestive issues
- Impending doom

### PANIC

- Unable to have rational thoughts
- Could be risk to self and others

**SYMPTOMS**

- Obsessive thoughts
- Chest pain
- Extreme fear
- Hallucinations

## TYPES of ANXIETY

### GENERALIZED ANXIETY DISORDER

General state of uncontrolled, excessive worry unproportional to situation lasting >6 months

### SPECIFIC PHOBIAS

Intense fear of a specific object, place or situation

### PANIC DISORDER

Sudden and intense surges of fear that can last minutes to hours

### SEPARATION ANXIETY

Intense fear when separated from a loved one

### SOCIAL ANXIETY DISORDER

Fear of social situations, interactions, presenting in front of groups due to fear of embarrassment

MAY HAVE (REAL OR FAKE) SYMPTOMS TO AVOID SITUATIONS

### AGORAPHOBIA

Extreme fear of certain places where the person feels unsafe

## CAUSES

- Family history
- Trauma
- Drug or alcohol abuse
- Physical and mental health problems
- Past or childhood experiences

## TREATMENT

### MEDICATIONS

- **Benzodiazepines:** short term use only (no longer than 3-4 months)
- **Buspirone:** takes 1-2 weeks for therapeutic effects to take place
- **SSRI's:** management of panic disorders

### NON-PHARMACOLOGICAL THERAPY

- Counseling/psychotherapy
- Deep breathing exercises
- Progressive muscle relaxation
- Guided imagery
- Exercise

## NURSING INTERVENTIONS

- Assess suicide risk
- Active listening
- Relaxation techniques
- Reassure patient they are safe and secure
- Stay with patient
- Help patient focus on reality
- Limit use of stimulants (caffeine, nicotine)

# AUTISM SPECTRUM DISORDER

**WHAT IS IT?** Developmental and neurological disorder that affects how a person socializes, perceives and communicates

## RISK FACTORS

**EXACT CAUSE UNKNOWN**

- Genetics
  - Fragile X syndrome
  - Rett syndrome
- Environmental factors
- Premature birth
- More common in males

## EARLY SYMPTOMS

- Little to no eye contact
- Not responding to name
- Lack of facial emotions
- Does not notice if another person is hurt or upset
- Not playing with other children
- Overly focused on certain topics or objects
- Detailed memory (advanced for their age)
- Repetitive movements that may cause self-harm
  - Biting
  - Banging head
- Hyperactivity or hypoactivity

## TREATMENT

**NO KNOWN CURE**

**GOAL:** SYMPTOM MANAGEMENT & ↑ QUALITY OF LIFE

### MEDICATIONS

- **SSRI's:** ↓ frequency of repetitive behaviors
- **Stimulants:** Helps ↑ focus and ↓ hyperactivity
- **Anxiolytics:** Helps relieve anxiety & panic disorders associated with ASD
- **Anticonvulsants:** Treat seizures associated with ASD

### NON-PHARMACOLOGICAL THERAPY

- **Applied Behavior Analysis (ABA):** Encourages desired behaviors and discourages bad behaviors
- Speech and language therapy
- PT & OT
- Cognitive-Behavior Therapy (CBT)

## LEVELS of AUTISM

### LEVEL 1 HIGHEST FUNCTIONING

**Needs support**

- ↓ interest in social interactions
- Organization & planning issues
- Impairments only noticeable without support

### LEVEL 2

**Needs SUBSTANTIAL support**

- Frequent repetitive behaviors
- Changing activities can cause distress
- Impairments noticeable even with support

### LEVEL 3

**Needs FULL support**

- Social and behavior severely impair daily life
- Extreme difficulty coping with change
- Rarely speaking logically and with few words

## EVALUATION

- **EARLY SCREENINGS:** 9 months, 18 months, & 24 or 30 months
  - ASSESSES LEARNING, SPEAKING, MOVEMENT, BEHAVIOR
- **ASQ OR M-CHAT:** screening questionnaires to be answered by parents

## NURSING INTERVENTIONS

- Avoid fast movements that may cause anxiety and fear
- Avoid loud noises and loud talking
- Turn off TV and avoid any distraction during exams or evaluations
- Position yourself near the patient's eye level
- Explain every procedure in short and simple sentences
- Remove objects from room that may cause injury

# BIPOLAR DISORDER

Mood disorder characterized by alternating periods of mania and depression as well as periods of normal functioning

## BIPOLAR DISORDER TYPES

### BIPOLAR TYPE 1

**MOST SEVERE**

At least 1 episode of **full mania** alternating with depression

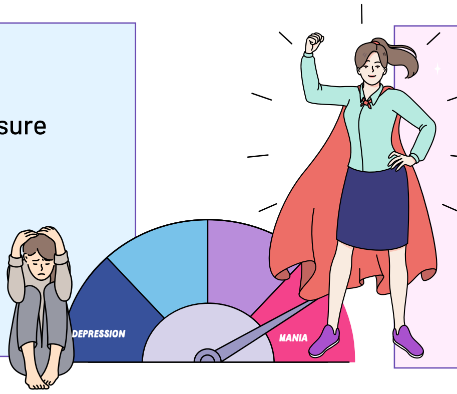
### BIPOLAR TYPE 2

At least 1 episode of **hypomania** alternating with depression

## SYMPTOMS

### DEPRESSION

- → Feeling sad or hopeless
- → Loss of interest or no pleasure in doing activities
- → Unintentional weight loss
- → Slowed behavior
- → Loss of energy



### MANIA

ABNORMALLY ELEVATED MOOD LASTING >1 WEEK

- → Hyperactive
- → Euphoria
- → Rapid speech
- → Easily distracted, irritated, or agitated
- → Delusions, hallucinations or illogical thinking
- → Unable to sleep
- → Flight of ideas

**HYPOMANIA**

Less severe manic symptoms that last > 4 days

## PATTERNS OF DEPRESSION & MANIA

| RAPID CYCLE | MIXED STATE |
|---|---|
| 4 or more manic, hypomanic, or depressive episodes within a 12 month period | Experiencing symptoms of mania & depression at the same time or back to back without periods in between |

## RISK FACTORS

- → Biochemical imbalances in the brain
- → Genetics
- → Brain lesions

## EVALUATION

- → Mental Status Examination (MSE)
- → Mood Disorder Questionnaire (MDQ)

**MDQ**

15 question, **self reporting** screening tool used to help identify patients with bipolar disorder

## TREATMENT

### MEDICATIONS

- → Anxiolytics: benzodiazepines
- → Lithium: monitor for **lithium toxicity**
- → Anticonvulsants
- → Antipsychotics
- → Antidepressants

### NON-PHARMACOLOGICAL THERAPY

- → Psychotherapy
- → Support groups
- → Electroconvulsive therapy

## NURSING INTERVENTIONS

### HIGH RISK FOR SUICIDE AND SELF-INJURY

- → 1:1 sitter if poses safety risk to others or self
- → Redirect hyperactive or aggressive behavior
  - ▸ Exercise, coloring, writing
- → Set limits on manipulative & grandiose behavior
- → Safe & low stimulus environment
  - ▸ Dim lights
  - ▸ Lower or turn off TV
  - ▸ Remove objects that can be used for self-harm
- → Diet
  - ▸ High protein finger foods during manic episodes
  - ▸ ↓ salt intake (↑ intake may lead to **lithium toxicity**)

**SIGNS OF LITHIUM TOXICITY**

- → Diarrhea
- → Tremors
- → Muscle weakness
- → Lack of coordination
- → Blurred vision
- → Tinnitus

# DEPRESSION

## WHAT IS IT?

Mood disorder of persistent feelings of sadness, hopelessness and loss of interest in daily activities

**STUDIES HAVE SHOWN PATIENT MAY HAVE:**

**↓ SEROTONIN**
- Mood regulation
- Sleep

**↓DOPAMINE**
- Motivation
- Pleasure

**↓ NOREPINEPHRINE**
- Stress response (fight or flight)
- Energy

## RISK FACTORS

- → Family history
- → Stressful life events
- → Hormonal changes
- → Alcohol or drug abuse
- → Chronic illness

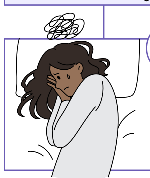
## TYPES of DEPRESSION

### MAJOR DEPRESSIVE DISORDER

Experience at least **5 or more symptoms** everyday for 2 weeks :

- → **Depression or anhedonia** (↓ ability to experience pleasure)
- → Sleep disturbances
- → Change in appetite/ weight
- → Suicidal thoughts
- → Indecisiveness
- → Inability to concentrate
- → ↓ interest in daily activities
- → Fatigue/ ↓ energy

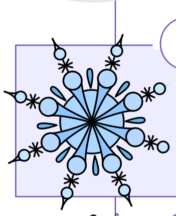
★ DEPRESSION OR ANHEDONIA MUST BE PRESENT



### PERSISTENT DEPRESSIVE DISORDER

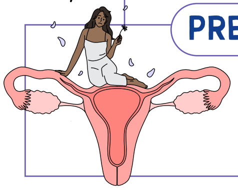
AKA "DYSTHYMIA"

Milder form of MDD that results in continuous, long-term depression → Must last at least 2 years in adults & 1 year in children/ adolescents



### SEASONAL AFFECTIVE DISORDER

Depression that occurs in a **seasonal pattern** → Often occurs during the winter months when there is less sunshine



### PREMENSTRUAL DYSPHORIC DISORDER

Depression associated with **menstruation** → Occurs during **luteal phase** of cycle

SOMETIMES REFERRED TO AS "SEVERE PMS"

## TREATMENT

### MEDICATIONS

- → Antidepressants
- → SSRI's: ↑ serotonin
- → SNRI's: ↑ serotonin availability
- → TCA's
- → Atypicals
- → MAOI's
  - **LAST option**; multiple risks/ side effects

### NON-PHARMACOLOGICAL THERAPY

- → Psychotherapy
- → Electroconvulsive therapy
- → St. John's wort

## NURSING INTERVENTIONS

### #1 PRIORITY: SAFETY★

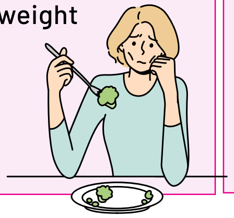
- → **Suicide precautions**
  - 1:1 observation
  - Remove potentially harmful items from room
  - No medications left in room
- → Stick to a regular daily schedule
- → Encourage socialization and participating in activities
- → Offer emotional support and listening
- → Encourage self care & physical activities

# EATING DISORDERS

## ANOREXIA NERVOSA

### WHAT IS IT?

Severe self-restriction of calories leading to ↓ body weight



### SYMPTOMS

- → Underweight
- → Refusing to eat in public
- → Fear of gaining weight
- → Amenorrhea (lack of menstruation)
- → Lanugo (growth of fine hair all over the body)
- → Cold extremities

### NURSING INTERVENTIONS

- → Supervise meals
- → Monitor exercise
- → Watch for pocket stuffing of food
- → Gradually increase weight

**WATCH FOR REFEEDING SYNDROME**

Fluid & electrolyte shifts due to ↑ nutrition too quickly in malnourished patient

## BULIMIA NERVOSA

### WHAT IS IT?

Repeated episodes of **BINGING** (eating large quantities of food) & **PURGING** (forced self-vomiting)

### SYMPTOMS

- → Normal weight to overweight
- → Tooth erosion or dental caries
- → Bad breath
- → Parotid swelling
- → Uncontrolled eating
- → Abuse of laxatives or diuretics

### NURSING INTERVENTIONS

- → Gradually increase intake
- → Monitor exercise
- → Monitor patient during and after meals to prevent purging
- → Nutritional counseling

## BINGE EATING

### WHAT IS IT?

Repeated episodes of **BINGING** (eating large quantities of food) **without purging**

### SYMPTOMS

- → Overweight to obese
- → Eats a lot of food over a 2-hour period
- → Eating secretly
- → Feeling guilty after eating
- → Lacks control when eating

### NURSING INTERVENTIONS

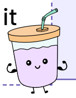
- → Cognitive behavioral therapy
- → Weight loss programs
- → Topamax: anticonvulsant to ↓ binge eating

## NURSING INTERVENTIONS

- → Reinforce health body image
- → Teach coping skills
- → Involve patient in choosing foods

**ENCOURAGE LIQUID FOODS OVER SOLIDS**

Eliminates decision if it is a trigger



- → Antidepressants
  - ▸ SSRI's
  - ▸ TCA's
  - ▸ MAOI's
- → Therapy
  - ▸ Cognitive behavioral therapy
  - ▸ Group therapy

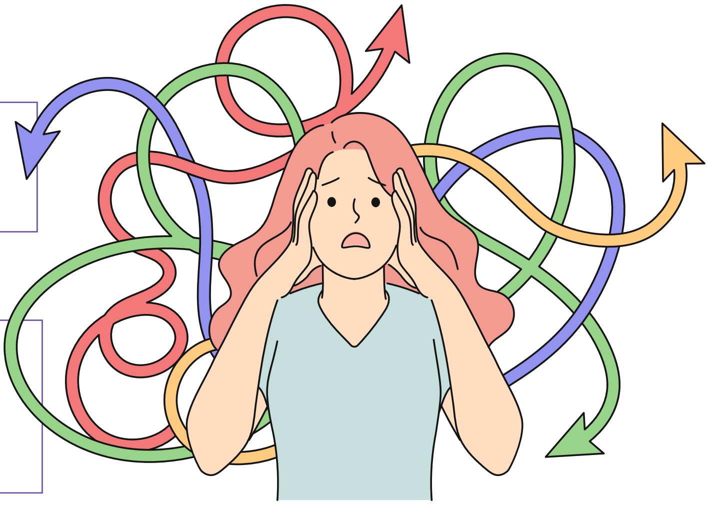
- → Monitor weights
- → Build & maintain trust
- → Monitor exercise

**ENCOURAGE MILD–MODERATE EXERCISE**

High intensity exercise burns excess calories & can contribute to eating disorder

MUST BE CLEARED BY PCP DEPENDING ON CLINICAL STATE

# OCD (OBSESSIVE COMPULSIVE DISORDER)



## WHAT IS IT?

**Anxiety disorder** marked by repetitive, persistent, and unwanted thoughts

## CAUSES/ RISK FACTORS

- Neurotransmitter imbalance (especially serotonin)
- Genetics
- Stress/ traumatic events

## SYMPTOMS

### OBSESSIONS

- Recurring and obsessive thoughts
- Uncontrollable obsessions (that take up at least one hour each day)
- Anxiety/ fear of harm to self or loves ones
- Fear of contamination and germs

### COMPULSIONS

- Repetitive actions (like handwashing, rearranging crooked objects)
- Rechecking or recounting several times
- Over-orderliness
- Sticking to a strict schedule

## TREATMENT

### MEDICATIONS

- Antidepressants
- Anxiolytics
- SSRI's

### NON-PHARMACOLOGICAL THERAPY

- Cognitive behavioral therapy
- Exposure and Response Prevention Therapy: exposes patient to trigger
- Psychotherapy

## NURSING INTERVENTIONS

- Set limits to OCD behavior
- Maintain safe environment
- Calm, quiet environment
- Positively reinforce good behavior
- Allow time for rituals before treatment begins without passing judgment

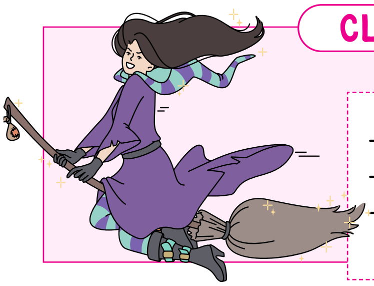
### STRESS MANAGEMENT

- Breathing exercises
- Meditation
- Exercise
- Attention-focused hobbies

# PERSONALITY DISORDERS

Impaired thinking, functioning and behaving in
regards to people, situations, and their environment

**LISTED AS SEPARATE AND DISTINCT CATEGORY IN THE DSM-5**



## CLUSTER A ODD OR ECCENTRIC

### PARANOID
- →Suspicious
- →Distrusting
- →Believes everyone wants to harm them

### SCHIZOID
- →Social withdrawal
- →Emotional detachment
- →Disinterest in social relationships

### SCHIZOTYPAL
- →Magical thinking
- →Eccentric appearance
- →Odd behavior
- →Indifferent & detached

## CLUSTER B OVERDRAMATIC OR EMOTIONAL

### ANTISOCIAL
- →Disregard for others
- →Aggressive & violent behavior
- →Lack of empathy
- →Can be charming

### BORDERLINE
- →Splitting behavior
- →Instability of identity
- →Manipulative
- →Fear of abandonment

### HISTRIONIC
- →Attention-seeking
- →Extroverted & sexually provocative
- →Overly concerned with appearance

### NARCISSISTIC
- →Egocentric, arrogant
- →Seeks admiration from others
- →Grandiose self perception

## CLUSTER C ANXIOUS OR INSECURE

### AVOIDANT
- →Avoids social interaction
- →Fear of rejection
- →Anxiety in social settings
- →Feelings of inadequacy

### DEPENDANT
- →Extreme dependence on others
- →Clingy & fear of separation
- →Avoids responsibility

### OBSESSIVE-COMPULSIVE
- →Perfectionism
- →Rigid
- →Stubborn
- →Desires control

## CAUSES

**CAUSE NOT FULLY KNOWN**

Thought to be combination of genes & early environmental influences

- → Substance abuse
- → Chemical imbalances
- → Traumatic experiences
- → Abusive childhood
- → Neglect

## TREATMENT

### MEDICATIONS
- → Antidepressants
- → Anxiolytics
- → Antipsychotics
- → Mood stabilizers

### NON-PHARMACOLOGICAL
- → Psychotherapy
- → Behavioral therapy
- → Group therapy

## NURSING INTERVENTIONS

- → **Suicide risk: safety is #1 priority**
- → Set clear & firm boundaries
- → Discuss positive and realistic goals
- → Provide reassurance and support
- → Provide positive feedback with good behavior
- → Maintain consistency in interactions with patient

# POST TRAUMATIC STRESS DISORDER

## WHAT IS IT?

Mental health condition that occurs after a person experiences or witnesses a traumatic event

BANG
BANG
BANG
BAN

## SYMPTOMS

**DX FOR PTSD WHEN SYMPTOMS OCCUR >4 WEEKS**

### PHYSICAL AND EMOTIONAL REACTIONS

- Trouble sleeping
- Easily startled
- Always on guard
- Insomnia

### INTRUSIVE MEMORIES

- Nightmares
- Flashbacks
- Panic attacks

### AVOIDANCE

- Increased alertness or avoidance
- Avoids talking about the incident
- Avoids objects or places that reminds them of the incident

### NEGATIVE CHANGES IN THINKING & MOOD

- Difficulty concentrating
- Hopelessness
- Lack of interest
- Irritability
- Anxiety

## CAUSES

**Traumatic events:**

- Assault
- Accident
- War
- Violence
- Natural disaster
- Abuse
- Extreme fear
- Death of loved one

## TREATMENT

### MEDICATIONS

- **Benzodiazepines:** ↓ anxiety
- **SSRIs & SNRIs**
- **Prazosin:** ↓ nightmares

### NON-PHARMACOLOGICAL-THERAPY

- Exposure therapy
- Cognitive therapy
- Support groups

## NURSING INTERVENTIONS

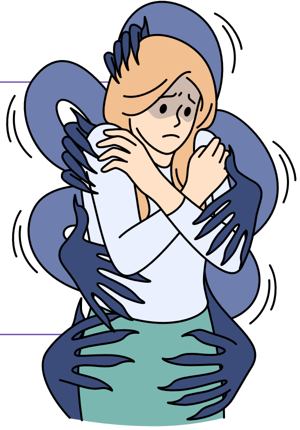
- **Assess if suicide risk**
- Teach coping strategies & stress management skills
- Reassure safety
- Avoid alcohol
- Encourage patient to express feelings & emotions

### HEALTHY COPING STRATEGIES

- Positive self-talk
- Music therapy
- Relaxation techniques
- Visualization
- Imagery

# SCHIZOPHRENIA

Marked by withdrawal from reality, delusions/illusions, illogical thinking, emotional, intellectual and behavioral disturbances



## CAUSES

Symptoms typically present between **AGES 15–25**

- Altered brain chemistry
- Genetic factors
- Family history
- Substance abuse

## SYMPTOMS

### ⊕ POSITIVE

Present symptoms that should **NOT** be there

- Hallucinations
- Delusions
- Anxiety/ agitation
- Disorganized behavior & speech

### ⊖ NEGATIVE

Lack of symptoms that **SHOULD** be there

- Apathy
- Anhedonia (↓ ability to experience pleasure)
- Flat affect
- Reduced speech

## COMMON TYPES of SCHIZOPHRENIA

### CATATONIC SCHIZOPHRENIA

- Immobility
- Fixed bizarre postures for hours (muscle rigidity)
- Mutism (no speech)
- Staring
- Severe negativism (lack of response to stimuli)

**MAIN PRIORITY: FLUID & NUTRITIONAL INTAKE**

Patient will avoid eating or drinking & will become extremely malnourished (may require complete care)

### PARANOID SCHIZOPHRENIA

- **Severe paranoia**
  May be suspicious that:
  - Someone is trying to poison them
  - They are being followed
  - Someone is out to get them
- Auditory hallucinations may be present

**MAIN PRIORITY: SAFETY & FOCUS ON REALITY**

**Never feed into patient's delusions.** Always acknowledge patient's feelings/ thoughts & reinforce reality

## TREATMENT

### MEDICATIONS

- Antipsychotics
  - 1st generation: Haloperidol
  - 2nd generation: Risperidone
- Benzodiazepines
- Mood stabilizers

### NON-PHARMACOLOGICAL THERAPY

- Psychotherapy
- Stress relief techniques

## NURSING INTERVENTIONS

- **Assess if suicide risk**
- Structured & calm environment
- Build trust with patient
- Encourage social interactions
- Show empathy & patience towards patient
- Use restraints as last resort if patient becomes danger to self or others (remove as soon as safely possible)
- Therapeutic communication

**EXAMPLE:**

"I understand the voices are very real to you and must feel scary, but I do not hear them."

Acknowledge patient with compassion & bring them back to reality

# SOMATOFORM DISORDERS

Mental health conditions characterized by physical symptoms
in which the cause cannot be explained medically

## SOMATIC SYMPTOM DISORDER

### WHAT IS IT?

Psychological stress expressed through physical symptoms that cannot be explained by a medical diagnosis or pathology

### SYMPTOMS

- Physical symptoms that do not align with tests
- Frequently seeking medical attention
- Constant fear of potential illness
- Stress ↑ somatic symptoms

### NURSING INTERVENTIONS

- Encourage patient to express feelings
- Respect patient's beliefs of symptoms as they are real to the patient
- Educate on coping mechanisms
- Encourage independence in self-care

**PHQ–15:** Assessment composed of 15 questions specifically assessing for somatic symptoms

## CONVERSION DISORDER

### WHAT IS IT?

Acute onset of neurological symptoms without a neurological diagnosis caused by psychological stress

### SYMPTOMS

- Paralysis or weakness
- Pseudoseizures ("false" seizures)
- Uncontrollable movements
- Loss of balance
- Vision problems

### NURSING INTERVENTIONS

- Ensure safety
- Establish trust with patient
- Assess recent stress levels
- Encourage patient to identify any triggers
- Assess & educate on coping mechanisms

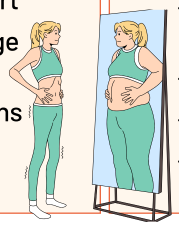
## BODY DYSMORPHIC DISORDER

### WHAT IS IT?

The exaggerated belief & preoccupation that the body is defective or deformed in some way that is false or unnoticeable to others

### SYMPTOMS

- Obsessing over body part
- Refusing to acknowledge body part
- Avoiding social situations
- Attempting to hide perceived flaw



### NURSING INTERVENTIONS

- Encourage patient to express feelings and emotions
- Encourage patient to participate in ADL's
- Set limits on maladaptive behaviors
- Encourage family interaction

## HYPOCHONDRIASIS

### WHAT IS IT?

Excessive worrying about having an illness or becoming seriously ill

↳ LASTS >6 MONTHS & DISEASE BEING FEARED MAY CHANGE

### SYMPTOMS

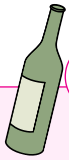
- Disproportionate anxiety about health
- Excessively checking for symptoms of illness
- Stress causes physical S+S
  - GI upset, palpitations, fatigue

### NURSING INTERVENTIONS

- Encourage expression of feelings & emotions
- Build trust with patient
- Educate on coping mechanisms & stress management
- Encourage therapy (CBT, group therapy, etc.)

# SUBSTANCE ABUSE DISORDERS

Dependency, abuse, or addiction to illicit substances or alcohol
that affects a person's everyday life & relationships



## ALCOHOL

### INTOXICATION S+S

- → Memory impairment
- → Slurred speech
- → ↓ coordination

### WITHDRAWAL S+S

**6 HOURS AFTER LAST DRINK**

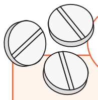
- → Shaky hands
- → Anxiety
- → Headache
- → Tachycardia
- → Nausea/ vomiting
- → Sweating

**48–72 HRS AFTER LAST DRINK**

- → Hallucinations
- → Delirium tremens
- → Delusions
- → **Seizures** MEDICAL EMERGENCY ⚠

### TREATMENT

- → **Benzodiazepines:** for withdrawal
  - ▸ Used to ↓ withdrawal symptoms & risk of seizures



## STIMULANTS

**Examples:** cocaine, amphetamines, ritalin, etc.

### INTOXICATION S+S

- → Euphoria
- → Dilated pupils
- → Hyperalertness
- → Paranoia

### WITHDRAWAL S+S

- → Sleep problems
- → Extreme mood swings
- → Tremors and shakiness
- → Chills & body aches
- → Depression
- → Clammy skin
- → Fatigue

### TREATMENT

- → Antidepressants
- → Benzodiazepines
- → Antipsychotics

## DEPRESSANTS

**Examples:** heroin, prescription opioids, benzodiazepines

### INTOXICATION S+S

- → Pinpoint pupils
- → **Respiratory depression**
- → Slurred speech
- → Drowsiness & ↓ alertness

### WITHDRAWAL S+S

- → Body aches & chills
- → Nausea/ vomiting
- → Restlessness
- → Insomnia
- → Anxiety
- → Diaphoresis
- → Body aches

### TREATMENT

- → Withdrawal medications
  - ▸ Methadone
  - ▸ Buprenorphine

## DSM-5 CRITERIA

Must have **2 out of 11 within 12 month period**

① Using extended amount or for extended amount of time
② Repeated efforts to quit without success
③ Large amount of time spent acquiring & using substance
④ Intense cravings to use substance
⑤ Neglecting responsibilities at home or work
⑥ Continuing to use even when it negatively affects relationships
⑦ Missing social or recreational activities due to substance
⑧ Continue to use when it puts others or self in danger
⑨ Increasing use to cope with stressful events
⑩ Increased tolerance
⑪ Experiencing withdrawal symptoms when not using

## TERMS

### DEPENDANCE

Body's physical addiction to a substance

### TOLERANCE

Requirement of higher dosage in order to obtain same response

### ADDICTION

The compulsive need to use a substance despite the harmful consequences

### WITHDRAWAL

Set of symptoms that manifest after abruptly stopping use of substance

# OB & MATERNITY

# GTPAL & MATERNITY TERMS

## MATERNITY TERMINOLOGY

**Amniotic fluid:** liquid that protects baby in uterus
**Amniotic sac:** sac that surrounds baby & amniotic fluid
**Braxton-Hicks contractions:** false contractions
**Cervix:** canal between the uterus & vagina
**Colostrum:** first breast milk produced
**Conception:** fertilization of egg & sperm
**Contraception:** measures used to prevent pregnancy
**Dilation:** cervix opening during labor
**Effacement:** thinning of the cervix during labor
**Engagement:** labor stage when baby's head enters pelvis
**Embryo:** fertilized egg
**Endometritis:** inflammation of uterine lining
**Endometriosis:** endometrial cells grow outside uterus
**Fertility:** the ability to become pregnant
**Fetal heart tones:** baby's heartbeat
**Fetus:** unborn baby
**Fibroids:** non-cancerous growths in uterus
**Fundus:** rounded top part of the uterus
**Gestation:** time between conception & birth
**Involution:** shrinking of uterus to original size
**Labor:** stages of active childbirth
**Lochia:** vaginal discharge after giving birth
**Meconium:** baby's first bowel movement when born
**Menopause:** time when period stops indefinitely
**Oligohydramnios:** lack of amniotic fluids
**Os:** opening of cervix
**Preterm birth:** baby born before 37 weeks
**Prom:** water breaking < 37 weeks
**Post-term:** pregnancy lasting >42 weeks
**Rupture of membranes:** water breaking

## GRAVIDY & PARITY

### PARITY

Number of times a woman has given birth >20 weeks

→ Includes living & stillborn births
→ Twins or triplets count as **one** pregnancy

| NULLIPARA | PRIMIPARA | MULTIPARA |
|---|---|---|
| 0 births > 20 weeks | 1 birth > 20 weeks | 2+ births > 20 weeks |

### TERMS TO KNOW

**GRAVIDA:** Woman who is pregnant
**GESTATIONAL AGE:** Age of baby in womb
**ABORTION:** Spontaneous or intentional termination of pregnancy
**MISCARRIAGE:** Spontaneous loss of pregnancy < 20 weeks

## GTPAL

**GTPAL** is an acronym used to obtain a more detailed breakdown of parity to assess a woman's full obstetric history

### GRAVIDA

# of times a woman has been pregnant

**Includes:**
- Current pregnancy
- Miscarriages & abortions
- Twins or triplets count as **one**

**NULLIGRAVIDA**
Never pregnant

**PRIMIGRAVIDA**
First pregnancy

**MULTIGRAVIDA**
2+ pregnancies

### TERM

# of babies born that reached full term

**Includes:**
- >37 weeks gestational age
- Alive or stillbirth
- Twins & triplets count as **one**

### PRETERM

# of pregnancies delivered preterm

**Includes:**
- 20-37 weeks gestational age
- Alive or stillbirth
- Twins & triplets count as **one**

### ABORTION

# of pregnancy loss before 20 weeks

**Includes:**
- Abortions & miscarriages
- Counts as gravidity
- Twins & triplets count as **one**

### LIVING CHILDREN

# of current living children

**Includes:**
All children counted individually (twins & triplets counted seperately)

### EXAMPLE

A 32 year old female is pregnant with twins. She has a 5-year old born at 37 weeks gestation, and had a miscarriage at 8 weeks gestation.

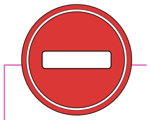
| G→3 | T→1 | P→0 | A→1 | L→1 |
|---|---|---|---|---|
| →Current pregnancy<br>→1 miscarriage<br>→1 full term (5 year old) | →1 full term<br>(5 year old) | →No preterm births | →1 miscarriage | →1 child<br>(5 year old) |

**ANSWER**
**3-1-0-1-1**

# CONTRACEPTION METHODS

## TYPES of CONTRACEPTION

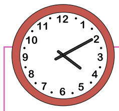
Methods to **PREVENT PREGNANCY**



### ABSTINENCE

Restraining from having sexual intercourse

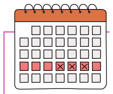
**MOST EFFECTIVE METHOD**



### COITUS INTERRUPTUS

Withdrawal of penis before ejaculation

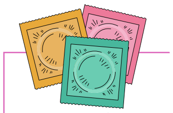
**NOT EFFECTIVE & DOESN'T PROTECT AGAINST STD'S**



### CALENDAR RHYTHM

Tracking of ovulation periods to determine when to avoid engaging in sexual intercourse

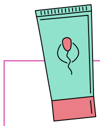
NOT USEFUL FOR **IRREGULAR PERIODS**



### CONDOMS

Thin sheath worn on the penis during sexual intercourse to prevent ejaculation into the uterus

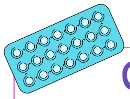
**ONLY METHOD PROTECTIVE AGAINST STD'S** (besides abstinence)



### SPERMICIDE

Product inserted into vagina before sexual intercourse to kill sperm cells before they enter the cervix

**DOES NOT PROTECT AGAINST STD'S**



### ORAL CONTRACEPTIVES

Pill that contains hormones that block the release of eggs into the ovaries

INCREASED RISK FOR **BLOOD CLOTS**

## OTHER METHODS

| VAGINAL RING | IUD | TUBAL LIGATION | PATCH |
|---|---|---|---|
| Small, soft plastic ring placed inside the vagina that releases hormones to prevent pregnancy | T-shaped device placed inside uterus to prevent pregnancy | Surgical procedure for female sterilization which involves tying of the fallopian tubes | Small patch that releases hormones in the body to prevent pregnancy |

## INFERTILITY

Inability to conceive after **12 months** of **regular unprotected sexual intercourse**

### OVULATORY DYSFUNCTION

- Endocrine disorders
  - PCOS (↑ testosterone production)
  - Cushing's (↑ cortisol)
  - Hypo/hyperthyroidism
- Functional hypothalamic amenorrhea
  - Hypothalamus doesn't stimulate pituitary to release FSH & LH

**CAUSED BY:**
- Excessive exercising
- Stress
- BMI <18.5 or >25

### ANATOMICAL DYSFUNCTION

- Tumors
- Endometriosis
- Pelvic inflammatory disease
- STD's
- Fallopian tube adhesions
- Radiation exposure (damages eggs)

### MALE INFERTILITY CAUSES

- Genetic disorders
- Testicular tumors
- Varicocele (enlarged veins compress testes)
- Cryptorchidism (testes don't ascend)
- Cystic Fibrosis

### ALTERNATIVE CONCEPTION METHODS

**IN VITRO FERTILIZATION (IVF):** Client's egg fertilized with sperm in lab, then embryo implanted into uterus

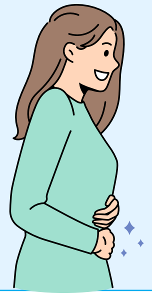
**SURROGATE:** A person agrees to carry & deliver baby for another person/ couple

**INTRAUTERINE INSEMINATION:** Sperm is placed directly into uterus using a small catheter

# SIGNS OF PREGNANCY

## PRESUMPTIVE

**ALL SUBJECTIVE SIGNS**



**Possible** signs of pregnancy

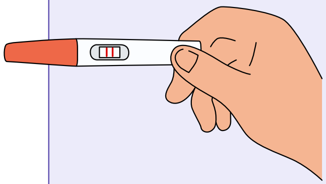
- → Fatigue
- → Enlarged & sore breasts
- → Missing period
- → Urinary frequency
- → Nausea & vomiting
- → Quickening (sensation of fetal movement)

**NOT DEFINITIVE DIAGNOSIS FOR PREGNANCY!**

Symptoms could be from other underlying conditions

## PROBABLE

**ALL OBJECTIVE SIGNS**

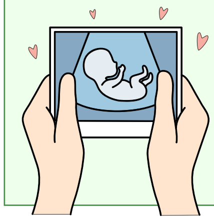


**Likely** signs of pregnancy

- → Positive pregnancy test
- → **Ballottement:** return of fetus when uterus pushed with finger
- → **Chadwick's sign:** blue/ purple discoloration of uterus
- → **Goodell's sign:** softening of cervix
- → **Hegar's sign:** softening of lower part of uterus
- → Braxton-Hick contractions (false contractions)
- → Enlarged uterus or abdomen

**STILL NOT DEFINITIVE**

## POSITIVE



Conclusive, definitive, absolute pregnancy

- → Fetus visualized on ultrasound
- → Fetal heart rate
- → Delivery of baby
- → Fetal movement **felt by provider**

★ SYMPTOMS THAT CAN **ONLY** BE ATTRIBUTED TO PREGNANCY

↓ ↓ ↓ ONCE PREGNANCY CONFIRMED ↓ ↓ ↓

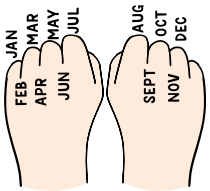
## NAEGELE's RULE

Tool used to calculate a pregnant woman's **ESTIMATED DELIVERY DATE (EDD)** based on **LAST MENSTRUAL PERIOD (LMP)**

**BASED ON...**

- → Calendar months (remember which days have 30 & 31 days)
- → 28 day menstrual cycle
- → Gestation lasting 280 days (40 weeks)
- → NO leap year

**HOW MANY DAYS ARE IN EACH MONTH?**



**MONTHS ON KNUCKLES**
31 days
**MONTHS B/W KNUCKLES**
30 days
*except February which has 28

### FORMULA

**FIRST DAY OF LAST MENSTRUAL PERIOD** – **3 MONTHS** + **7 DAYS** + **1 YEAR**

### EXAMPLE

1st day of LMP: **MAY 4TH, 2022** → Minus 3 months: **FEB 4TH, 2022** → Plus 7 days: **FEB 11TH, 2022** → Plus 1 year: **FEB 11TH, 2023**

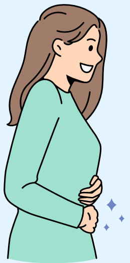
EDD

# TRIMESTERS & FETAL DEVELOPMENT

## PRENATAL CARE

### 1ST TRIMESTER

**WEEKS 0-12**



- 1st prenatal visit
- Obstetric history obtained (GTPAL)
- EDD Calculated (Naegele's Rule)
- Ultrasound: abdominal or transvaginal
- Labs
  - CBC
  - UA
  - Pap Smear
  - STI's
  - HIV
  - Blood type & Rh factor
  - Hep B
  - Rubella titer

### 2ND TRIMESTER

**WEEKS 13-26**

- Fetal heart rate assessed
- Gestational diabetes screening
- MSAFP: test for genetic abnormalities
- Amniocentesis (if MSAFP abnormal)
- Abdominal ultrasound
- Fundal height assessments

### 3RD TRIMESTER

**WEEKS 27-40**

- After 36 weeks, prenatal visits become weekly
- Rhogam given to Rh negative patients
- tDaP vaccine
- Non-stress tests for high risk pregnancy
- Group-B strep test

## WHAT TO AVOID DURING PREGNANCY

| FOOD | MEDICATIONS | ACTIVITIES |
|---|---|---|
| Alcohol | Tetracyclines | High impact sports |
| Smoking | Warfarin | Acupuncture & massage |
| ↑ mercury foods | Sulfonamides | Hot tubs |
| Unpasteurized dairy & juices | Anticonvulsants | Radiation exposure |
| Raw foods | Lithium | Changing cat litter |
| ↑ caffeine | ACE inhibitors | Heavy lifting |

## FETAL DEVELOPMENT

### MONTH 1

- Egg turns into embryo
- Spinal cord forms

### MONTH 2

- Facial features noticeable
- Arms & legs developed
- US will show gestational sac

CONFIRMS PREGNANCY

### MONTH 3

- Heartbeat detectable by doppler
- Early reflexes present
- Faint fetal movements

### MONTH 4

- Gender detectable by US
- Heartbeat detectable by stethoscope
- Lanugo starts to form

### MONTH 5

- Passive antibody transfer begins
- Fetal sleep patterns evident
- Spontaneous fetal movements

### MONTH 6

- Age of viability outside uterus
- Lung surfactant begins to develop
- Pupils react to light

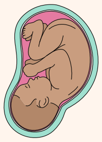
### MONTH 7

- Alveoli start to mature
- Testes descend into scrotum
- Surfactant in amniotic fluid

### MONTH 8

- Lanugo starts to diminish
- Muscles and bones fully developed
- SubQ fat deposited

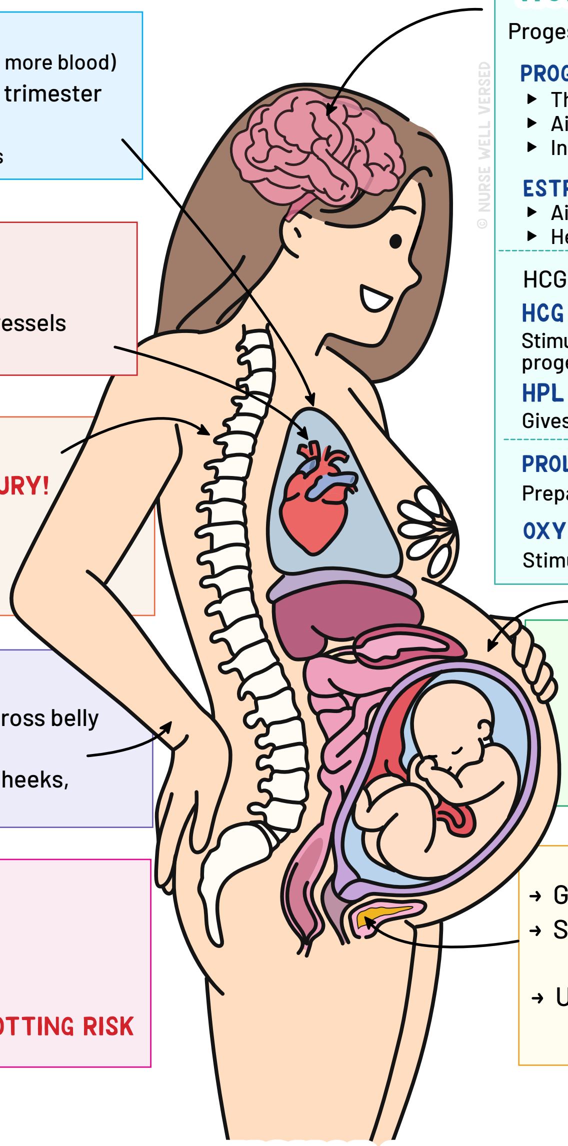
### MONTH 9



- Fetus very active
- Vernix formed
- Vertex position

OB/ MATERNITY

# PREGNANCY PHYSIOLOGY



## RESPIRATORY

- ↑ oxygen needs (lungs oxygenating more blood)
- Uterus size ↑ causing SOB in late trimester
- ↑ tidal volume ↑ RR
  - May have mild respiratory acidosis

## CIRCULATORY

- ↑ cardiac output
- ↑ blood volume
- Uterus compresses pelvic blood vessels
  - Varicose veins

## MUSCULOSKELETAL

- ↑ Relaxin hormone: more flexible ligaments & joints + **RISK FOR INJURY!**
- **Lordosis:** center of gravity shifts forward causing arch in lower back
- Low back pain & calf cramping

## SKIN

- **Striae:** stretch marks
- **Linea nigra:** Dark line that runs across belly during pregnancy
- **Melasma:** Brown patches on the cheeks, forehead or nose

## HEMATOLOGICAL

- ↑ fibrinogen
- ↑ WBC
- ↑ blood volume

**HYPERCOAGULABLE STATE= ↑ CLOTTING RISK**

## HORMONES

Progesterone & estrogen **RISE DRAMATICALLY**

### PROGESTERONE

- Thickens uterine lining
- Aids in milk duct development
- Inhibits oxytocin during pregnancy

### ESTROGEN

- Aids in fetal development
- Helps maintain uterine lining

HCG and hPL are **PRODUCED BY PLACENTA**

### HCG

Stimulates corpus luteum to produce estrogen & progesterone to maintain pregnancy

### HPL

Gives nutrition to fetus and regulates metabolism

### PROLACTIN

Prepares breasts for milk production

### OXYTOCIN

Stimulates contractions during start of labor

## GASTROINTESTINAL

- ↑ progesterone causes GI muscles to relax
  - Heartburn
  - Constipation (from ↓ motility)
- Nausea/ vomiting from ↑ HCG

## RENAL/URINARY

- GFR ↑ up to 50% from ↑ plasma volume
- Smooth muscle of bladder relaxes
  - ↑ risk of UTIs
- Uterus presses on bladder
  - Urgency & frequency

## NUTRITIONAL NEEDS

### WEIGHT GAIN

**1ST TRIMESTER:** 2 to 4 pounds

**2ND-3RD TRIMESTER:** 1 pound /week

### CALORIES

**WILL NEED EXTRA 300-500 CALS/ DAY**

Advise intake of complex carbs to regulate glucose & insulin

**DO NOT RESTRICT CALORIES! FETUS IS RAPIDLY GROWING**

### CAFFEINE

**<200 MG/ DAY**

↓ blood supply to fetus & inhibits growth

### PROTEIN

**60G/DAY MINIMUM FOR ENTIRE PREGNANCY**

#### COMPLETE PROTEINS

Contain all 9 amino acids

- Meat
- Poultry
- Eggs
- Dairy

#### INCOMPLETE PROTEINS

Does **not** contain all 9 amino acids (non-animal sources)

- Nuts
- Legumes
- Whole grains
- Vegetables

B12 is found in animal protein

**↓ INTAKE= ↓ B12**

(Vegetarians/ vegans need B12 supplement)

### FOLIC ACID

Helps prevent **neural tube defects**

**HIGHLY RECOMMENDED WHEN TRYING TO CONCEIVE**

2-3 months pre-pregnancy & until 12 weeks pregnant

### VITAMINS

**VITAMIN D:** Calcium absorption

**VITAMIN A:** TOO MUCH= BIRTH DEFECTS

TOO LITTLE= ↓ NIGHT VISION

★ Advise ↑ intake of fruits & vegetables to meet daily needs

### PICA

Cravings for unusual non-food related items (salt, ice, clay, dirt)

**May be triggered by vitamin deficiency**

**↑ RISK OF PRETERM DELIVERY & ↓ BIRTH WT**

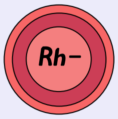
# RH INCOMPATIBILITY

## WHAT IS IT?

Occurs when **RH-POSITIVE FATHER** & **RH-NEGATIVE MOTHER** have an **RH-POSITIVE BABY**

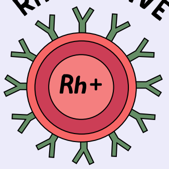
**CAUSES HARM TO BABY, NOT THE MOTHER**

### RH NEGATIVE

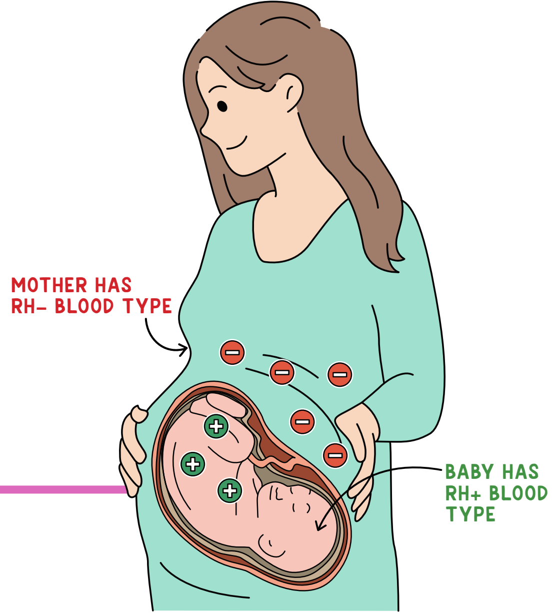


**NO** Rh factor protein on RBC

### RH POSITIVE



**PRESENT** Rh factor protein on RBC



## PATHO

Mother & baby's **blood mix**, causing mother to create **antibodies** against baby's Rh+ blood

CALLED SENSITIZATION

## WHEN DOES MOTHER & BABY'S BLOOD MIX?

Most commonly **after the birth of their 1st child** when placenta detaches

### OTHER WAYS BLOOD CAN MIX THAT CAN AFFECT 1ST CHILD

| ABRUPTIO PLACENTAE | AMNIOCENTESIS |
|---|---|
| Placenta detaches from uterine wall before delivery | Invasive procedure; amniotic fluid is aspirated via needle |

Rh incompatibility will occur during **SECOND PREGNANCY** if baby is Rh+ → Mother has developed antibodies (become **sensitized**) from 1st Rh+ pregnancy → **CAN ONLY OCCUR IF MOTHER IS RH- & FATHER IS RH+**

(No issues will occur if baby is Rh-)

## SYMPTOMS

Mother passes antibodies to baby through **passive immunity** & **ATTACKS BABY'S RBC'S**

Hemolysis occurs in baby's RBC's which can lead to **severe fetal anemia**

- → **Hypoxia** (hgb carry 02)
- → **Heart failure** (heart trying to compensate)
- → **Splenomegaly & hepatomegaly** (body creating more immature RBC's)
- → **Jaundice** (↑ bilirubin from hemolysis)
- → **Neurotoxicity** (issues in brain development)

**SEVERE CASES CAN LEAD TO FETAL DEATH**

## DIAGNOSTICS

**COOMBS TEST:** detects for antibodies against RBC's

**Indirect Coombs:** Blood taken from mother

NEGATIVE= NORMAL | POSITIVE= ABNORMAL → DO NOT GIVE RHOGAM

**Direct Coombs:** Blood taken from baby or umbillical cord

POSITIVE= ABNORMAL → Baby may develop anemia & jaundice

## TREATMENT

**GOAL: PREVENT SENSITIZATION IN MOM!**

Test mother's blood type at 1st **prenatal visit**

**IF RH POSITIVE:** no treatment needed

**IF RH NEGATIVE (& BABY RH POSITIVE):**

- → Rhogam shot at 28 weeks
- → Rhogam shot within 72 hours after delivery

**RHOGAM** stops the immune system from creating antibodies against RBC's

If baby is **RH POSITIVE (+ DIRECT COOMBS):**

- ▸ Fetal blood transfusions during pregnancy
- ▸ Phototherapy: for jaundice at birth
- ▸ Folic acid: ↑ RBC

### TIPS

- ★ **RhoGAM is given to protect the BABY, not the mother**
- ★ If the mother is already sensitized (+ indirect coombs), RhoGAM will **not** be effective
- ★ Every mother gets RhoGAM after Rh+ baby if they are Rh-

## INTRAPARTUM COMPLICATIONS: BLEEDING

# PLACENTA PREVIA

### WHAT IS IT?

Placenta attaches to lower part of uterus **partially or fully covering cervical opening**

**MARGINAL PREVIA**

placenta edge is **near** cervical opening

**PARTIAL PREVIA**

placenta **partially** covers cervical opening

**TOTAL PREVIA**

placenta **fully** covers cervical opening

Usually diagnosed second trimester around **20 WEEKS**

↳ MARGINAL or PARTIAL may correct itself

**RECHECK AT 30-32 WEEKS GESTATION**

### RISK FACTORS

- → Maternal age >35 years old
- → Multi-parity (twins/triplets)
- → Uterine scarring (c-section, fibroids)
- → Previous placenta previa
- → Smoking/cocaine use

### SYMPTOMS

- → Bright red, **painless** vaginal bleeding
- → Soft, non-tender uterus/abdomen
- → Normal fetal VS
- → Spontaneous bleeding after sex
- → Abnormal fetal position
  (placenta blocking normal position)

### COMPLICATION: PLACENTA ACCRETA

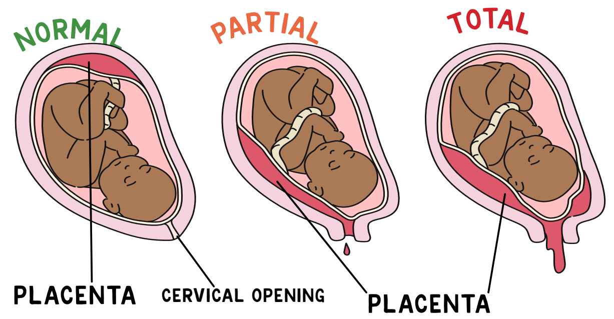
Placenta attaches firmly & deeply into uterine wall

**MEDICAL EMERGENCY ⚠**

**CAN CAUSE MASS HEMORRHAGING DURING BIRTH**

**TREATMENT**

- ▸ Cesarean section
- ▸ Hysterectomy



Placenta attached near/on cervical opening causes **BLEEDING**

### DIAGNOSTICS

Ultrasound **DEFINITIVE TEST**

↳ Visualize location of placenta

### TREATMENT

**PELVIC REST**

- ⃠ **NO** vaginal exams
- ⃠ **NO** sexual intercourse
- ⃠ **NO** abdominal manipulation

**IF NO/ VERY LIGHT BLEEDING**

- → Bedrest for rest of pregnancy
- → No strenuous exercise

**IF BLEEDING**

- → Continuous monitoring
- → Baby & mom VS
- → Monitor blood loss (pad count)
- → Blood transfusion + fluids
- → Tocolytics: to stop contractions
- → **Left side lying position:** maximizes blood flow to baby

**IF BLEEDING DOESN'T STOP WILL NEED C-SECTION**

If baby planned to be delivered **before 37 weeks:**

- → Give mother steroids
  - ▸ Helps mature baby's lungs faster to avoid risk of respiratory complications after delivery

## INTRAPARTUM COMPLICATIONS: BLEEDING

# PLACENTAL ABRUPTION

## WHAT IS IT?

**Detachment of the placenta** from the uterine wall before delivery

Most at risk of occuring during **3RD TRIMESTER**

Most commonly a few weeks before giving birth

## RISK FACTORS

- Chronic hypertension
- Previous placental abruption
- High parity (giving birth multiple times)
- Trauma to abdomen
- Premature rupture of membranes
- Advanced maternal age (>35 years old)
- Smoking or cocaine use

## SYMPTOMS

**CONCEALED BLOOD LOSS:** blood pooling inside mother

- **Dark red** vaginal bleeding
- Extended fundal height
- Hard abdomen
- Severe continuous abdominal pain
- Rigid & tender uterus
- Fetal distress: **late decelerations**

## COMPLICATION: DIC

**MEDICAL EMERGENCY** ⚠

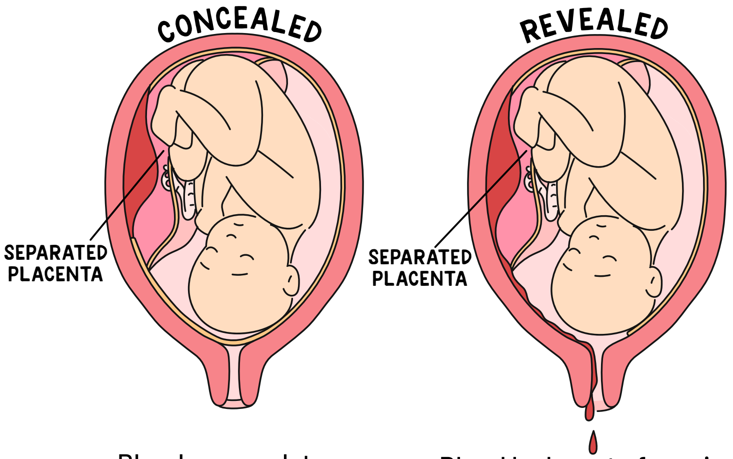
Placenta detachment triggers clotting cascade, causing **severe abnormal clotting & bleeding**

### SYMPTOMS

- Bleeding gums, oozing at IV sites
- Petechiae or purpura
- Chest pain, dyspnea, oliguria

### TREATMENT

- Blood products
  - Platelets to ↓ bleeding
  - Fresh frozen plasma to ↑ clotting
  - Cryoprecipitate to ↑ fibrinogen
  - RBC to replace blood loss & volume
- IV fluids
- Heparin: stop clotting



Blood accumulates behind uterine wall

Blood leaks out of cervix causing vaginal bleeding

**PARTIAL ABRUPTION**

Placenta **partially** detaches

**COMPLETE ABRUPTION**

Placenta **completely** detaches

## ROLE OF PLACENTA

Organ that develops during pregnancy to:

- Remove waste from baby
- Deliver nutrients & O2 to baby

**THE PLACENTA USUALLY DETACHES AND IS DELIVERED 10-20 MINUTES FOLLOWING CHILDBIRTH**

## NURSING INTERVENTIONS

- **Bedrest**
- **NO** vaginal exams
- Monitor VS of mother and baby (q15 min)
- Monitor bleeding
  - Count & weigh pads
  - Monitor fundal height & abdominal girth
- **Left side lying position:** maximizes blood flow to baby
- Labs
  - Type & cross
  - Coags
  - CBC
- Prepare mother for delivery
  - Vaginal if baby & mom stable
  - C-section if signs of distress
- Emotional support

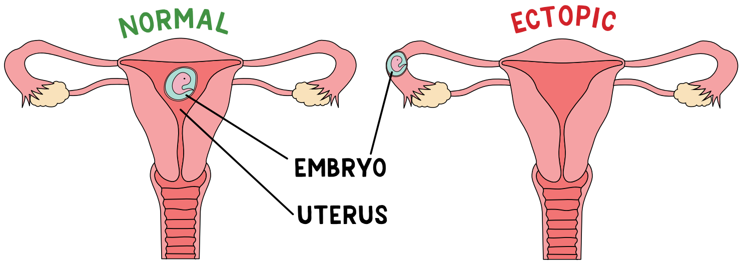
## INTRAPARTUM COMPLICATIONS: BLEEDING

# ECTOPIC PREGNANCY

## WHAT IS IT?

The fertilized egg implants and grows outside of the uterus

**MOST COMMON IN FALLOPIAN TUBE**



Usually diagnosed
**6–8 WEEKS GESTATION**

If ectopic pregnancy occurs in place with more space (abdomen) symptoms may not appear until weeks later

## RISK FACTORS

- Pelvic inflammatory disease
- In vitro fertilization
- IUD
- History of tubal ligation or pelvic surgery
- Previous ectopic pregnancy
- Smoking

All cause **SCARRING** which prevents embryo from moving into the uterus

## PATHO

Embryo unable to complete journey to uterus

↓

Implantation occurs outside uterus

↓

Embryo begins to grow

↓

Spontaneous abortion occurs due to ↓ blood supply or damage to mother's tissues

## SYMPTOMS

**EARLY PREGNANCY SIGNS STILL PRESENT**

- Sharp abdominal pain
- Light vaginal bleeding
- May have palpable mass near uterus

## DIAGNOSTICS

**ULTRASOUND:** may show mass in fallopian tube or excess fluid in peritoneal cavity

**HCG LEVELS:** will be elevated with absence of uterine pregnancy

### COMPLICATION

### RUPTURED FALLOPIAN TUBE

Growing embryo runs out of space & damages fallopian tube

**MEDICAL EMERGENCY ⚠**

**CAN CAUSE MASS HEMORRHAGING OR INFECTION**

**SYMPTOMS**

- Severe, acute abdominal/ pelvic pain
- Referred shoulder pain
- Hypotension
- Pallor
- Tachycardia

**TREATMENT**

- IV Fluids
- Blood transfusion
- Salpingectomy: ligate bleeding vessels & remove damaged fallopian tube

## TREATMENT

**UNCOMPLICATED ECTOPIC PREGNANCIES MAY RESOLVE SPONTANEOUSLY**

- Methotrexate: terminates pregnancy
  - Folic acid antagonist
  - Stops cell growth and dissolves existing cells
- Leucovorin: ↓ side effects of methotrexate
- Salpingostomy: laparoscopic removal of unruptured ectopic embryo

**NURSING INTERVENTIONS**

- Monitor VS & EKG for signs of shock
- Assess & manage pain
- Monitor for bleeding
- Strict I & O
- Emotional support

# INTRAPARTUM COMPLICATIONS: BLEEDING

# MOLAR PREGNANCY

AKA HYDATIDIFORM MOLE

## WHAT IS IT?

A type of **GESTATIONAL TROPHOBLASTIC DISEASE** in which abnormal degeneration and proliferation of **trophoblastic villi** occur due to an abnormally fertillized egg

### TROPHOBLASTIC VILLI

Tiny finger-like projections of placental tissue that:

① Helps embryo attach to uterine wall
② Protects embryo during pregnancy
③ Allows passage of nutrients to fetus

## RISK FACTORS

- Low protein intake
- >35 or <20 years old gestational age
- Asian ethnicity
- History of previous molar pregnancy

## SYMPTOMS

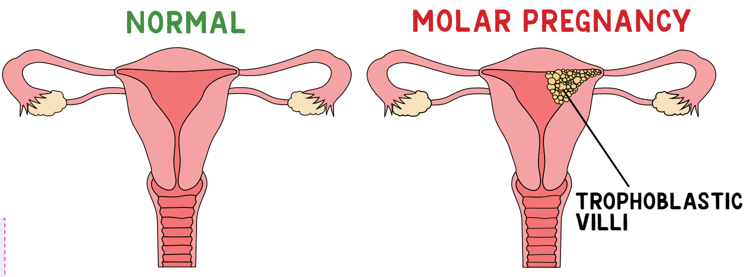
- Dark vaginal bleeding
  - Dark brown-purple color like prune juice
- Passing of "grape-like clusters" tissue
- Higher than expected fundal height
- Cramping
- Nausea & vomiting

## TREATMENT

- **Dilation and curettage:** removal of abnormal tissue from inside uterus (not a viable pregnancy)
- Monitor hCg levels until they return to normal
- Hysterectomy if high risk of developing gestational trophoblastic neoplasia

### NURSING INTERVENTIONS

- Monitor for bleeding
  - Count & weigh pads
  - Monitor fundal height & abdoominal girth
- Monitor VS & CBC
- Assess for signs of infection
- Provide emotional support



PARTIAL MOLE

Embryonic tissue is **present**

COMPLETE MOLE

Embryonic tissue is **absent**

A **HYDATIDIFORM MOLE** is a **benign** growth that can become **malignant**

called **Choriocarcinoma**

## PATHO

Fertilization occurs with abnormal amount of DNA

↓

Embryo unable to develop completely

↓

Rapid proliferation & edema of villi fill uterus (grape-like structures)

↓

**Prevents healthy maturation of embryo**

## DIAGNOSTICS

**ULTRASOUND:** will show collection of abnormal gestational sacs (looks like snowstorm)

**HCG LEVELS:** will be abnormally elevated

## EDUCATION

- Monitor hCg levels for 6 months after D&C
- Avoid pregnancy for 1 year
  - Risk of choriocarcinoma: malignant
- Help patient understand why pregnancy is not viable

## INTRAPARTUM COMPLICATIONS: BLEEDING

# SPONTANEOUS ABORTION

## WHAT IS IT?

Loss of pregnancy by natural causes **before 20 weeks gestation or before baby weighs at least 500g**

AKA **MISCARRIAGE**

## RISK FACTORS

- → Advanced gestational age
- → Previous pregnancy loss
- → Trauma to uterus
- → Tobacco, alcohol, or drug use
- → Infection
- → Malnourishment
- → Congenital abnormalities
- → Low progesterone

## SYMPTOMS

- → Vaginal bleeding
  - ▶ Can range from light to heavy depending on type of abortion
- → Dull or sharp cramping
- → Contractions

## COMPLICATION: SEPTIC ABORTION

Infection due to products of conception left in uterus; **can occur in missed, inevitable, or incomplete abortion**

| SYMPTOMS | TREATMENT |
|---|---|
| → Fever | → Broad spectrum ABX |
| → Uterine pain/ tenderness | → IV Fluids |
| → ↑ WBC | → D & C |

## TREATMENT

**COMPLETE ABORTION** typically requires no intervention

- → **Dilation and curettage:** removal of contents from uterus
- → **Misoprostol:** induces abortion
- → **Mifepristone:** ↑ efficacy of misoporostol
- → **RhoGAM:** if patient Rh-

## TYPES of ABORTION

### THREATENED ABORTION

- → Vaginal bleeding before 20 weeks gestation
- → NO cervical dilation
- → Embryo is viable

### INEVITABLE/ IMMINENT ABORTION

- → Products of conception may be intact or expelled
- → Cervical dilation present
- → Embryo is already deceased

### COMPLETE ABORTION

- → All products of conception expelled
- → Cervical dilation present
- → Embryo is deceased
- → Mild bleeding present

### INCOMPLETE ABORTION

- → Embryo is deceased but some products of conception remain intact
- → Cervical dilation present
- → SEVERE vaginal bleeding

### MISSED ABORTION

- → Embryo is deceased & remains inside uterus
- → Partial conception contents still intact
- → NO cervical dilation
- → Brown vaginal discharge present

### RECURRENT/HABITUAL ABORTION

3 consecutive miscarriages at same gestational age

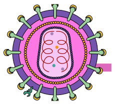
## DIAGNOSTICS

**ULTRASOUND:** will show no embryonic activity

**PELVIC EXAM:** determine type of abortion

**HCG LEVELS:** rise during pregnancy & fall after abortion

# INFECTION PREGNANCY COMPLICATIONS



## HIV/ AIDS

If mother is HIV/AIDS positive, it can be passed through the placenta and infect the fetus via **vertical transmission**

**TESTED ASAP (1ST VISIT) + DURING THIRD TRIMESTER**

### METHODS OF TRANSMISSION

- →From placenta to fetus during pregnancy
- →During delivery after water breaks
- →Breastfeeding

### SYMPTOMS (INTRAPARTUM)

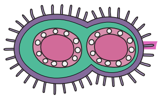
- →Fever & chills
- →Muscle & joint pain
- →Weight loss
- →Sore throat
- →Mouth sores
- →Night sweats

### TREATMENT

- →Antiretrovirals
- →C-section: if viral load >1000
- →No breastfeeding

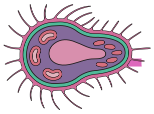
### SYMPTOMS (NEWBORN)

- →Low birth weight
- →Skin rash
- →Persistent fever
- →Diarrhea
- →Swollen lymph nodes
- →Lack of energy



## STD'S

| | CHLAMYDIA | GONORRHEA | SYPHILIS | TRICHOMONIASIS |
|---|---|---|---|---|
| **SYMPTOMS** | ▸ Vaginal discharge<br>▸ Abdominal pain<br>▸ Dysuria | ▸ Vaginal discharge<br>▸ Abdominal pain<br>▸ Dysuria | ▸ Flu-like symptoms<br>▸ Skin rashes<br>▸ Swollen lymph nodes | ▸ Green vaginal discharge<br>▸ Genital itching<br>▸ Dysuria |
| **IF UNTREATED MAY LEAD TO:** | ▸ Pelvic inflammatory disease<br>▸ PROM<br>▸ Low birth weight | ▸ ↑ risk of miscarriage<br>▸ Preterm birth<br>▸ Severe eye infection (newborn) | ▸ Stillborn birth<br>▸ Congenital abnormalities<br>▸ Perisistent fever | ▸ PROM<br>▸ Low birth weight<br>▸ Infertility |
| **TREATMENT** | Doxycycline or Azithromycin | Ceftriaxone | Penicillin | Metronidazole |



## GROUP B STREP

Bacterial infection of the urinary tract, reproductive organs, or digestive system **(frequent in vagina & rectum)**

**TESTED AT 36 WEEKS GESTATION**

### METHODS OF TRANSMISSION

Can be passed to newborn only during **vaginal delivery**

### SYMPTOMS (INTRAPARTUM)

Usually doesn't cause symptoms

- →Fever
- →Fetal tachycardia

### TREATMENT

- →Antibiotics during labor
- →May need c-section

### SYMPTOMS (NEWBORN)

- →Sepsis
- →Weak muscle tone
- →Respiratory distress

## TORCH INFECTIONS

Group of infections that can pass from mother to baby and cause fetal abnormalities (aka **teratogenic** infections)

### TOXOPLASMOSIS

Found in raw meat, garden soil & cat feces

- →No cleaning litter box
- →No gardening
- →Fully cook foods

### OTHER

- ▸ Hepatitis
- ▸ Varicella
- ▸ Parvovirus

### RUBELLA

**Tested for early in pregnancy**

- →Get vaccinated **postpartum**
- →Cannot receive live vaccines intrapartum

### CYTOMEGALOVIRUS

Transmitted through contact with body fluids

- →Newborn will need antiviral therapy
- → Practice good hand hygiene!

### HERPES SIMPLEX

Can pass to baby during delivery if active lesions

- →Antivirals during pregnancy
- →May opt for c-section
- →Do not kiss babies!

**CAN CAUSE:**

- →Low birth weight
- →Fever
- →Cataracts
- →"Blueberry muffin" rash
- →Hearing loss
- →Congenital heart disease

VARY DEPENDING ON UNDERLYING CONDITION BUT ALL SHARE SAME NON-SPECIFIC SYMPTOMS

# MEDICAL PREGNANCY COMPLICATIONS

## HYPEREMESIS GRAVIDARUM

Extreme, persistent nausea & vomiting during pregnancy

**USUALLY OCCURS DURING 1ST TRIMESTER**

### RISK FACTORS

- →Rapid ↑ in hCg levels
- →Multi-gestational pregnancy
- →1st time pregnancy
- →Hx of motion sickness

### SYMPTOMS

- →Vomiting > 3x/ day
- →Weight loss
- →Dehydration
- →Dizziness

### TREATMENT

- →Identify trigger foods
- →IV fluids
- →Antiemetics
- →Vitamin B6

## GESTATIONAL DIABETES

Diabetes that develops during pregnancy & usually resolves after childbirth

**USUALLY OCCURS DURING 2ND–3RD TRIMESTER**

### RISK FACTORS

- →Maternal age >25 years
- →Obesity
- →Previous baby weight >9 lbs
- →Family hx of diabetes

### SYMPTOMS

- →**P**olyuria
- →**P**olydypsia
- →**P**olyphagia

3 P's

### TREATMENT

- →Daily glucose monitoring
- →Diet & exercise
- →Insulin
- →Oral anti-diabetics

**IF UNTREATED:** ↑ risk for delivering **macrosomic** (large) baby with **hypo**glycemia

↳ **MAY REQUIRE C-SECTION**

## GESTATIONAL HYPERTENSION

High blood pressure that develops during pregnancy & classified by severity

### GESTATIONAL HTN

BP ≥ 140/90 **after 20 weeks gestation**

Must be **2** separate **readings ≥ 6 hrs apart**

→

### PRE- ECLAMPSIA

Gestational HTN + **present proteinuria**

Urinalysis will show **mild proteinuria measured +1**

→

### SEVERE PRE-ECLAMPSIA

BP ≥ 160/100 + **severe proteinuria**

- ▶ Protein +3 (UA)
- ▶ Severe headache

→

### ECLAMPSIA

**Pre-eclampsia** with present **seizures**

Can onset from mild or severe pre-eclampsia

### RISK FACTORS

- → Gestational diabetes
- → Multiparity
- → Maternal age <20 or >40
- → 1st pregnancy
- → Obesity
- → Family hx

### SYMPTOMS

All related to **hypertension**

- → Blurry vision
- → Headache
- → Shortness of breath
- → ↓ urine output
- → Tachycardia
- → Epigastric pain

## HELLP SYNDROME

**SEVERE COMPLICATION**

**H**EMOLYSIS **E**LEVATED **L**IVER ENZYMES **L**OW **P**LATELETS

Variant of pre-eclampsia that causes severe complications of the blood & liver

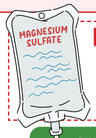
### SYMPTOMS

**Eclampsia symptoms +**

- → BLEEDING
- → RUQ pain
- → Dyspnea
- → Nausea & vomiting
- → Neuro changes

### TREATMENT

- → Delivery of baby
- → Blood products
- → Antihypertensives
- → Corticosteroids (for premature delivery)
- → Magnesium (seizures)



### MAGNESIUM TOXICITY SIGNS:

- → Flushing
- → RR<12
- → ↓ DTR
- → ↓ urine output

**ANTIDOTE: CALCIUM GLUCONATE**

# STAGES OF LABOR

## FIRST STAGE

LASTS LONGER FOR 1ST TIME MOMS

Starts with **true labor contractions** & ends with **full dilation of cervix**

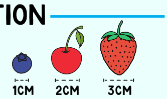
**SIGNS**
- STRONG pressure on rectum
- Intense urge to push
- Feel like need to have BM

ONSET OF LABOR

### LATENT PHASE

**CERVIX DILATION**

1-3 cm



**CONTRACTIONS**
- →Mild & irregular
- →Every 15-30 mins
- →Last 20-45 seconds each

**MOTHER**

Excited & talkative

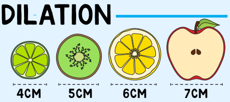
**NURSING INTERVENTIONS**
- →Encourage ambulation
- →Warm bath or massage
- →Breathing techniques

→

### ACTIVE PHASE

**CERVIX DILATION**

4-7 cm



**CONTRACTIONS**
- →Moderate & regular
- →Every 3-5 mins
- →Last 40-60 seconds each

**MOTHER**

Apprehensive & intense

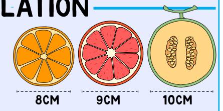
**NURSING INTERVENTIONS**
- →Encourage urination
  (full bladder can hinder contractions)
- →Monitor VS (mom & baby)
- →Position changes

→

### TRANSITION PHASE

**CERVIX DILATION**

8-10 cm



**CONTRACTIONS**
- →Strong & intense
- →Every 2-3 mins
- →Last 60-90 seconds each

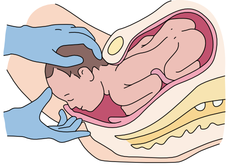
**MOTHER**

Restless & agitated

**NURSING INTERVENTIONS**
- →Monitor VS (mom & baby)
- →Pant-blow breathing
- →Assess for perineal bulging

## SECOND STAGE

PUSHING PHASE



Starts with **full dilation** & ends with **delivery of baby**

### DURATION

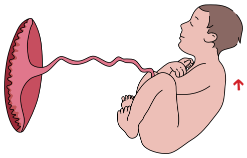
**1st time moms:** 2-3 hours

**Multipara:** 30 mins

### NURSING INTERVENTIONS
- →Monitor VS (mom & baby)
- →Encouragement to mom
- →Educate on pushing & positioning
- →Note time of delivery

## THIRD STAGE

5–30 MINS AFTER CHILDBIRTH



Starts with **birth of infant** & ends with **delivery of placenta**

LONGER TIME SPENT IN PHASE= ↑ RISK OF HEMORRHAGE & INFECTION

### SIGNS OF PLACENTA DELIVERY
- →Lengthening umbilical cord
- →Gush of blood
- →Uterus shape changes from oval to globular

### NURSING INTERVENTIONS
- →Administer oxytocin after placenta delivery to prevent hemorrhaging
- →Encourage skin to skin contact with baby
- →Assess if placenta is fully intact

### DELIVERY MECHANICS

**"Dirty Duncan"**
Dull, rough, red maternal side presenting first

assess for **retained placental fragments**

**"Shiny Shultz"**
Shiny fetal side of placenta presenting first

## FOURTH STAGE

RECOVERY PHASE

First 4 hours after birth of placenta

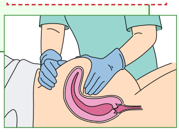
### NURSING INTERVENTIONS
- → Monitor VS
  - BP & HR (risk for hemorrhage)
  - Temp (risk of infection)
- → Pain management
- → IV fluids
- → Ice packs & witch hazel for episiotomy
- → Promote bonding with baby
- → Monitor lochia (discharge)
  - Moderate with small clots normal
  - LARGE clots abnormal
- → Monitor fundus

**SHOULD BE:**
- Firm
- Midline
- At or near umbilicus

FUNDUS DECREASES 1CM PER DAY AFTER DELIVERY

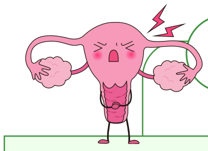
**IF FUNDUS IS:**
- Soft
- Boggy
- Displaced

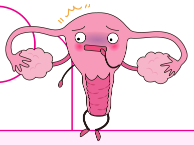
PERFORM FUNDAL MASSAGE



# TRUE vs. FALSE LABOR

## CONTRACTIONS





AKA BRAXTON HICKS CONTRACTIONS

| | TRUE | FALSE |
|---|---|---|
| **FREQUENCY** | Predictable & regular | Unpredictable & irregular |
| **INTENSITY** | → Persistent<br>→ Stronger, longer & closer together<br>→ Do NOT resolve with comfort measures<br>→ Gets **worse** with walking | → Inconsistent<br>→ Sometimes weak, sometimes strong<br>→ Stops with comfort measures<br>→ Gets **better** with walking |
| **LOCATION** | → Discomfort **radiates**<br>→ Starts in lower back and radiates to abdomen<br>→ Vaginal pressure starting at top of uterus | → Discomfort in local area only<br>→ Front of abdomen & above navel<br>→ NO radiation to other areas |

## CERVIX

| **PROGRESSIVE** CHANGES IN CERVIX | NO CHANGES IN CERVIX |
|---|---|
| → Dilation | → NO dilation |
| → Effacement | → NO effacement |
| → Bloody show | → NO bloody show |
| → Fetal position change<br>(Baby may come into LOA position) | → NO fetal position change |
| → Fetal engagement | → NO fetal engagement |

## SIGNS OF LABOR

- → "Water breaking" (rupture of membranes)
- → "Bloody show" (blood tinged mucus from cervix)
- → Persistent back pain
- → Lightening (baby "dropping" deeper into pelvis)
- → Increased urinary frequency (pressure on bladder)
- → Sudden burst of energy

## FALSE LABOR PAIN CARE

### STAY HOME

No need to go to hospital unless contractions meet **5–1–1 RULE**

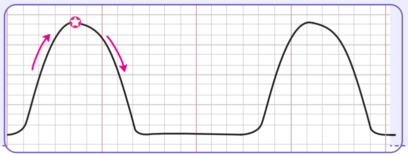
- → Change positions
- → Engage in activities like walking
- → Drink fluids
- → Rest & relax

### 5–1–1 RULE

**5** MINUTE INTERVALS

**1** MINUTE DURATION

**1** HOUR PERIOD

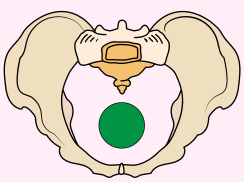


# 5 P'S OF LABOR

## PASSAGEWAY

**BIRTH CANAL (SHAPE OF MOTHER'S PELVIS)**

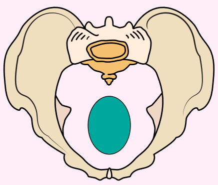
**GYNECOID**



Round

**MOST FAVORABLE**

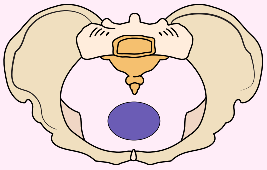
**ANTHROPOID**



Long & oval

**2ND MOST FAVORABLE**

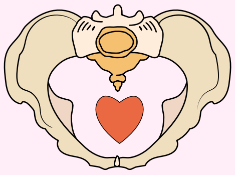
**PLATYPELLOID**



Flat & oval

**SHALLOW SHAPE**

**ANDROID**



Heart shaped

**COMMON MALE SHAPE**

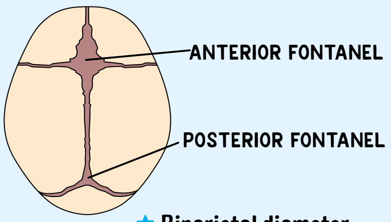
**MAY REQUIRE C-SECTION** (Platypelloid, Android)

## PASSENGER

**CHARACTERISTICS OF THE FETUS**

### FETAL HEAD SIZE

Fontanelles make skull flexible while passing through birth canal (molding)

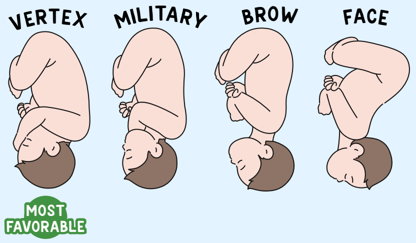


★ **Biparietal diameter** should be 9.25 cm at term

### FETAL ATTITUDE

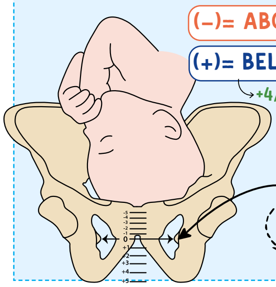
Fetus's posture

FLEXED ⊢——⊣ EXTENDED



### FETAL STATION (measured in cm)

How far down baby's presenting part has descended into pelvis



**(−)= ABOVE ISCHIAL SPINE**

**(+)= BELOW ISCHIAL SPINE**

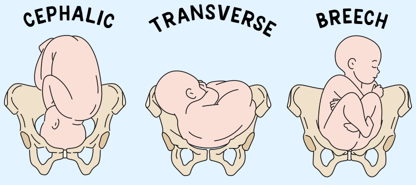
+4/ +5 means baby coming soon!

**0=ISCHIAL SPINE** means baby is engaged

**AKA LIGHTENING** (Baby dropping into pelvis)

### FETAL PRESENTATION

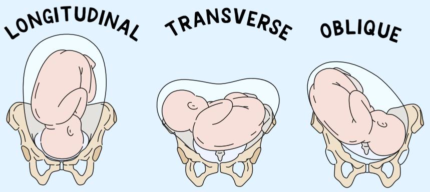
Part of fetus that is leading or presenting first



| CEPHALIC | TRANSVERSE | BREECH |
|---|---|---|
| Head first | Scapula first | Pelvis first |
| MOST FAVORABLE | C-SECTION | C-SECTION |

### FETAL LIE

Relation of fetus's back to mom's back



| LONGITUDINAL | TRANSVERSE | OBLIQUE |
|---|---|---|
| Baby's back **parallel** to mom's back | Baby's back **perpendicular** to mom's back | Baby's back **angled** to mom's back |

### FETAL POSITION

How the fetus is positioned in the womb

**Described in 3 letter labels**

**1ST LETTER: L OR R**

Is the fetus turned left or right?

**2ND LETTER: O,S OR M**

Which part of the fetus is presenting first?

| O= OCCIPUT | S= SACRUM | M= MENTUM |
|---|---|---|
| Head first | Sacrum first | Chin first |

**3RD LETTER: A,P OR T**

Which direction is the fetus facing?

| A=ANTERIOR | P=POSTERIOR | T=TRANSVERSE |
|---|---|---|
| Facing forward | Facing backwards | Lying on side |

## POSITION

Mother's position while giving birth

**UPRIGHT:** Sitting or standing

**ALL FOURS:** On hands & knees

**LITHOTOMY:** On back with knees bent or feet in stirrups

**LATERAL:** Lying on side

★ **CHANGE POSITIONS FREQUENTLY TO PROMOTE COMFORT**

## POWER

Contractions (change depending on stage of labor)

**FREQUENCY:** How often they occur

**INTERVAL:** Time between contractions

**DURATION:** How long contraction lasts

**INTENSITY:** How weak/strong they are

## PSYCHOLOGY

Psychological state of the mother

**FACTORS AFFECTING PSYCHOLOGICAL STATE:**

- → Support system
- → Previous experiences
- → Information from staff
- → Knowledge of condition
- → Anxiety, fear & pain

# FETAL POSITIONING & STATION

## LEOPOLD MANEUVERS

Used to help determine fetal characteristics

### MANEUVER 1: FUNDAL GRIP

Used to determine fetal **PRESENTATION**

Using both hands, palpate the upper abdomen

**NORMAL FINDINGS:**

- → Head firm, hard, & round
- → Head moves separately from trunk
- → Buttocks symmetrical & soft

### MANEUVER 2: UMBILICAL GRIP

Used to determine fetal **POSITION**

Use one hand to steady uterus on one side and use the other hand to gently but **deeply** palpate the abdomen

**NORMAL FINDINGS:**

- → Fetal back smooth & firm
- → Protrusions of extremities

### MANEUVER 3: PAWLICK'S GRIP

Used to determine fetal **ENGAGEMENT**

Using thumb & finger, grasp the lower part of abdomen above symphysis pubis & press slightly, moving side to side

**MOVEABLE= NOT ENGAGED**

**NOT MOVEABLE= ENGAGED**

### MANEUVER 4: PELVIC GRIP

Used to determine fetal **ATTITUDE**

Facing feet of mother, use both hands to palpate fetal head pressing downward toward pubis

**GOOD ATTITUDE (FLEXED)**
Brow opposite fetal back

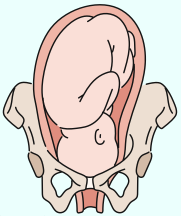
**POOR ATTITUDE (EXTENDED)**
Brow same side fetal back

**TIPS**

- ⋆ If head can't be felt, likely descended into pelvis
- ⋆ If brow easily felt, likely in posterior position

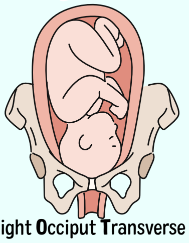
## FETAL POSITIONS

**ROA**



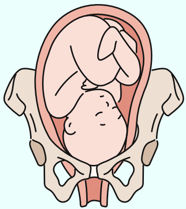
Right Occiput Anterior

**ROT**



Right Occiput Transverse

**ROP**

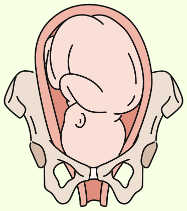


Right Occiput Posterior

**MOST FAVORABLE POSITIONS**

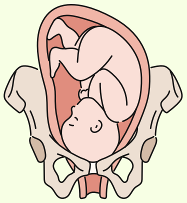
Mom may have back pain aka **"BACK LABOR"**

**LOA**



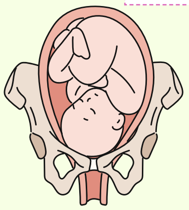
Left Occiput Anterior

**LOT**



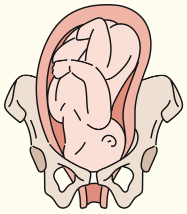
Left Occiput Transverse

**LOP**



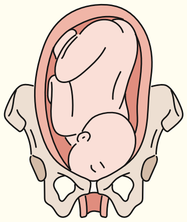
Left Occiput Posterior

**RMA**



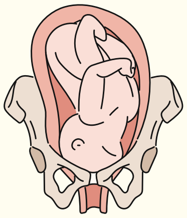
Right Mentum Anterior

**RMP**



Right Mentum Posterior

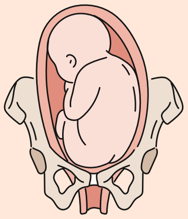
**LMA**



Left Mentum Anterior

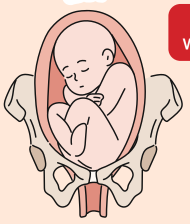
↑ **RISK OF TRAUMA: do not** try to manually rotate baby
(MAY NEED C-SECTION)

**LSA**



Left Sacrum Anterior

**LSP**

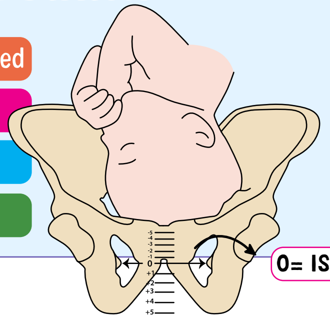


Left Sacrum Posterior

**BREECH= BAD**
will need c-section

## FETAL STATION

- **-1 TO -5:** Fetus head not engaged
- **0:** Fetus head **engaged**
- **+1 TO +3:** Baby coming soon
- **+5:** Head is **crowning**



**0= ISCHIAL SPINE**

# FETAL HEART TONES

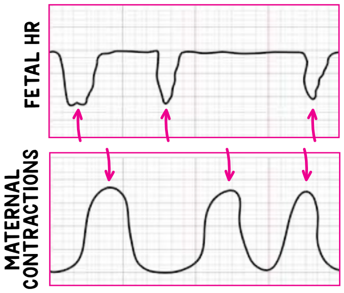
Remember **VEAL CHOP MINE**

| | | |
|---|---|---|
| **V**ariable decelerations | **C**ord compression | **M**ove mother |
| **E**arly decelerations | **H**ead compression | **I**ntervention not needed |
| **A**ccelerations | **O**kay! | **N**o intervention needed |
| **L**ate decelerations | **P**lacental insufficiency | **E**mergent actions needed |

**NORMAL FETAL HR**
**110–160 BPM**

## VARIABLE DECELERATIONS

REMEMBER VARIABLE LOOK LIKE V'S



### WHAT IS IT?

Fetal heart rate varies in duration & timing

### CAUSE

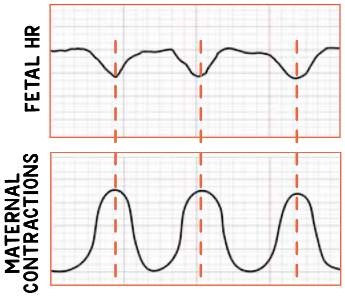
Cord compression

### INTERVENTIONS

- Change mother's position
  - **Left side-lying** to ↑ 02 to baby
- Administer oxygen
- Stop pitocin infusion (pitocin ↑ contractions)
- Contact PCP

## EARLY DECELERATIONS

DO NOT ACTUALLY COME EARLY!



### WHAT IS IT?

Fetal heart rate **mirrors** mother's contractions

Goes up when contraction starts & goes down when it ends

### CAUSE

Head compression (from being in birth canal)

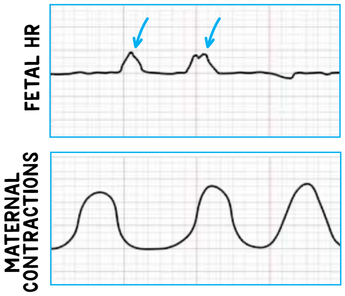
### INTERVENTIONS

**No intervention needed**

NORMAL!

Continue to monitor

## ACCELERATIONS



### WHAT IS IT?

Short term increase in fetal HR above baseline

Lasts at least **15 seconds**

### CAUSE

- Fetal movement
- Sign of fetal wellbeing

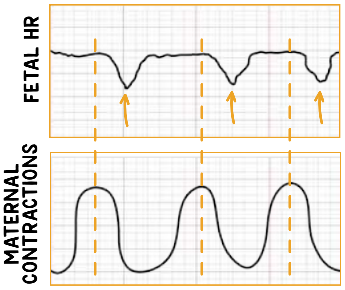
### INTERVENTIONS

**No intervention needed**

NORMAL!

Continue to monitor

## LATE DECELERATIONS



### WHAT IS IT?

Fetal heart rate slows **after** contraction has started & recovers after contraction is over

### CAUSE

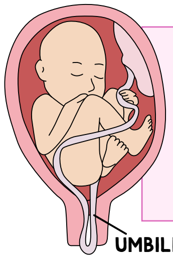
Placental insufficiency

### INTERVENTIONS

- Change mother's position
  - **Left side-lying** to ↑ 02 to baby
- Administer oxygen & IV fluids
- Stop pitocin infusion (pitocin ↑ contractions)
- Contact PCP
- **May require emergent delivery**

# LABOR COMPLICATIONS

## CORD PROLAPSE



### WHAT IS IT?

Umbilical cord presents before fetus resulting in cord compression

### RISK FACTORS

- →Abnormal fetal presentation
- →PROM
- →Multiparity
- →Polyhydramnios (too much amniotic fluid)

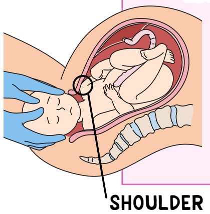
### SYMPTOMS

- →Visible cord
- →Palpable cord on exam
- →Variable decelerations

### TREATMENT

- →Reposition mother (knee to chest or trendelenburg)
- →Relieve pressure on cord
  - ▸Manually lift babies head & maintain until delivery
- →Emergent delivery
- →Wrap prolapse cord in NS gauze

## DYSTOCIA



### WHAT IS IT?

Difficult or prolonged labor due to mechanical factors

### RISK FACTORS

- →Small pelvic inlet
- →Maternal fatigue
- →Advanced maternal age
- →Macrosomia

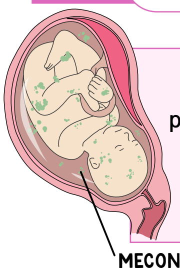
### SYMPTOMS

- →"Turtle sign"
  - ▸shoulder is stuck behind pelvic bone & head retracts back
- →Abnormally slow descent of fetus during delivery

### TREATMENT

- →Apply suprapubic pressure (for shoulder dystocia)
- →Rotational maneuvers
- →Drain bladder
- →Forceps/ vacuum assisted birth
- →Position changes
- →C-section if unsuccessful

## MECONIUM STAINED AMNIOTIC FLUID



### WHAT IS IT?

Meconium (1st stool) passed by baby before childbirth

### RISK FACTORS

- →Fetal distress
  - ▸Hypoxia
  - ▸Cord compression
- →Post-term babies
- →Prolonged delivery

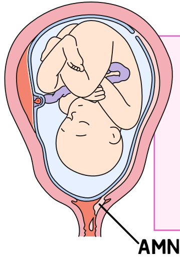
### SYMPTOMS

- →Greenish amniotic fluid
- →Late or variable decelerations
- →Fetal hypoxia
  - ▸Fetal cyanosis
  - ▸Tachypnea

### TREATMENT

- →Neonatal resuscitation
- →Monitor FHR & VS
- →Suction newborn's airways with bulb syringe
- →Mechanical ventilation may be needed

## PREMATURE RUPTURE OF MEMBRANES



### WHAT IS IT?

Amniotic sac breaks ("water breaking") before labor begins

### RISK FACTORS

- →Abdominal trauma
- →Stress
- →Infection
- →Uterine distention
- →Tobacco or drug use
- →Low BMI

### SYMPTOMS

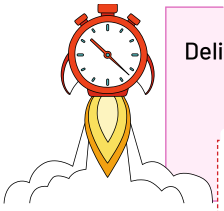
- →Gush of clear fluids from vagina
  - ▸Can be small or large
  - ▸Can leak continuously or intermittently

### TREATMENT

**For >34 weeks**
- →Immediate delivery

**For <34 weeks**
- →Steroids to ↑ fetal lung maturity
- →Tocolytics to delay delivery
- →Mag sulfate (prevent neuro defects)
- →Bed rest

## PRECIPITOUS LABOR



### WHAT IS IT?

Delivery of baby within 3 hours of start of contractions

**RISK OF**
- ▸Tearing
- ▸Postpartum hemorrhage
- ▸Infection (if born in unsterile environment)

### RISK FACTORS

- →Multiparity
- →Strong contractions
- →Young maternal age
- →Gestational hypertension
- →Low birth weight

### SYMPTOMS

- →Sudden onset of contractions with close intervals
- →Intense pain with each contraction
- →Long contraction that feels never-ending

### TREATMENT

- →IV fluids
- →Administer oxygen
- →Side lying position
- →Emotional support
- →Prepare for possible c-section

# NEWBORN ASSESSMENT

## APGAR SCORE

Scale to quickly assess newborn after birth
**Completed at 1 minute and 5 minutes after birth**

| SCORE | 0 POINTS | 1 POINT | 2 POINTS |
|---|---|---|---|
| **APPEARANCE** Skin color | Blue/ pale | Pink body, blue limbs | Pink |
| **PULSE** | Absent | <100 bpm | >100 bpm |
| **GRIMACE** Reflex response | Floppy | Minimal response | Prompt response |
| **ACTIVITY** Muscle tone | Flaccid | Flexed arms & legs | Active |
| **RESPIRATIONS** | Absent | Slow & irregular | Strong cry |

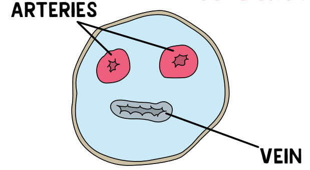
### SCORE INTERPRETATION

| | |
|---|---|
| 0–3 POINTS | Severe fetal distress + immediate resuscitation |
| 4–6 POINTS | Guarded condition (needs airway suction + 02) |
| 7–10 POINTS | Baby's in good health |

## NORMAL NEWBORN VITAL SIGNS

| | |
|---|---|
| BLOOD PRESSURE | **Systolic** 60-80 mmHg<br>**Diastolic** 40-50 mmHg |
| MAP<br>MEAN ARTERIAL PRESSURE | ≥ to # weeks gestation |
| HEART RATE | 110-160 bpm |
| RESPIRATORY RATE | 30-60 breaths/min |
| TEMPERATURE | 97.7- 99.5 F (36.5-37.5 C) |

## UMBILICAL CORD

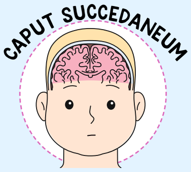


Should have TWO arteries & ONE vein

If one artery is absent, could indicate congenital heart & kidney abnormalities

## HEAD

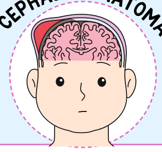
**CAPUT SUCCEDANEUM**



**Swelling of newborn's scalp**

- Due to pressure from labor
- Swelling crosses suture lines
- Usually resolves within few days

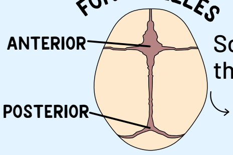
**CEPHALOHEMATOMA**



**Blood collection between scull & scalp**

- Due to traumatic birth
- Swelling does not cross suture lines
- Can take months to resolve

**FONTANELLES**



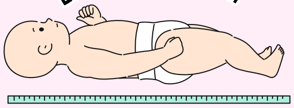
Soft spots in skull that allow baby to pass through birth canal through **molding**

BULGING FONTANELLES= ↑ ICP
SUNKEN FONTANELLES= DEHYDRATION

ANTERIOR FONTANELLE closes at 12-18 months
POSTERIOR FONTANELLE closes at 6-8 weeks

## MEASUREMENTS

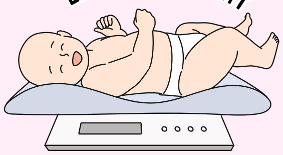
**EXPECTED LENGTH**



17–22 INCHES (44–55 CM)

Measured crown to heel lying supine with legs straight

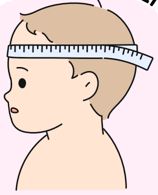
**EXPECTED WEIGHT**



2,500G– 4,000G
(5.8 LBS– 8.14 LBS)

Lose 5-10% of birthweight first few days of life & gain back within a week

**HEAD CIRCUMFERENCE**



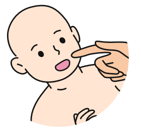
14–15 INCHES (32–38 CM)

Measured above eyebrows & should be about 2 cm larger than chest circumference

**CHEST CIRCUMFERENCE**
About 2 cm < than head circumference

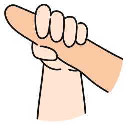
## REFLEXES

**ROOTING**



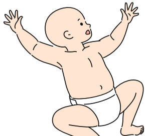
**Looking for food**
Looking toward direction face is stroked and open mouth

**PALMAR**



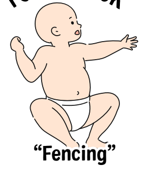
**Gripping**
Light touch of palm causes baby to tightly grip around object

**MORO**



**Startle**
Extend arms & then flex towards body in response to loud noise or sudden movement

**TONIC NECK**



**"Fencing"**
When baby is laid on back & head turned, arm on same side extends & arm on opposite side flexes

## NORMAL SKIN DEVIATIONS

| | |
|---|---|
| **MILLIA**<br>Small, white bumps on skin | **VERNIX CASEOSA**<br>White, creamy substance that covers newborn's skin |
| **ACROCYANOSIS**<br>Bluish discoloration of newborn's hands & feet | **PORT WINE STAIN**<br>Flat, pinkish-red markings seen on head or neck |
| **MONGOLIAN SPOTS**<br>Non-blanching blue-grey spots on sacrum or thighs | **ERYTHEMA TOXICUM**<br>Pink rash that appears on abdomen & disappears within 2 weeks |

OB/ MATERNITY

# POSTPARTUM ASSESSMENT

REMEMBER **BUBBLEHE**

## BREASTS

- Determine if mom is breastfeeding or bottle feeding
- Evaluate breasts for:
  - Size
  - Shape
  - Firmness
  - Redness
  - Symmetry

### BREAST-FEEDING MOMS:

- Assess for colostrum
- Teach breastfeeding positions

### COLOSTRUM

First milk body produces that contains immune globulins

### BOTTLE-FEEDING MOMS:

- Teach about breast engorgement
- Do NOT express milk (will ↑ milk production)

### MASTITIS

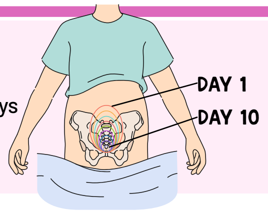
Infection of breast surrounding milk ducts causing swelling & pain

- Continue breastfeeding
- Warm compress
- Antibiotics

## UTERUS

Monitor fundal height

Should be at or near umbilicus after childbirth & ↓ by 1 cm everyday for 10 days



### IS IT FIRM OR BOGGY?

Make a C shape with hand & push on lower fundus

**STABILIZED= FIRM= GOOD**

**MOVEABLE= BOGGY= BAD**

RISK OF HEMORRHAGE

### CAUSES

- Full bladder
- Retained placental fragments
- Uterine atony

### INTERVENTIONS

- Have patient void
- Fundal massage

## BLADDER

Urinary retention is common due to:

- ↑ progesterone inhibits bladder muscles
- Epidural
- Episiotomy
- Prolonged second stage labor

### INTERVENTIONS

- Create voiding schedule
- Monitor I&O
- Straight catheterization if needed

### URINARY RETENTION ↑ RISK OF

- Urinary tract infection
- Boggy uterus leading to **bleeding**

## BOWELS

Constipation is common due to:

- Sore perineum from episiotomy or trauma
- Dehydration
- ↓ activity

### INTERVENTIONS

- Encourage fluid intake
- Stool softeners
- ↑ fiber intake

### EDUCATION

- Do NOT strain!
  - Can rip episiotomy or c-section sutures

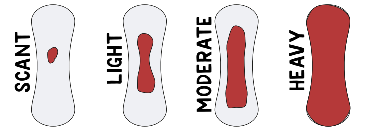
## LOCHIA

VAGINAL DISCHARGE AFTER BIRTH

Assess lochia for:

- Amount
- Color
- Odor

### AMOUNT



### COLOR

| | |
|---|---|
| RUBRA | **Bright red:** lasts up to 3 days |
| SEROSA | **Pinkish-brown:** 4-10 days postpartum |
| ALBA | **Whitish-yellow:** can last up to 6 weeks |

### ODOR

Should have **no** foul odor present

Foul odor or change in odor may indicate infection

## EPISIOTOMY

An **episiotomy** is a perineal incision made during childbirth to widen the opening of the vagina for passage of the baby

### REEDA ASSESSMENT

Inspect episiotomy for:

- **Redness**
- **Edema**
- **Ecchymosis**
- **Discharge**
- **Approximation**

### PERINEAL ASSESSMENT

- Pull labia from front to back
- Assess for hematoma formation
- Assess for hemorrhoids or tearing

## HOMAN'S SIGN

↑ risk of DVT after childbirth

### HOMAN'S TEST

Mom flexes calf at 90 degree angle and dorsiflexes foot

**PAIN= POSITIVE**

Could indicate DVT

FURTHER TESTING REQUIRED

### SYMPTOMS

- Pain in calf
- Swelling
- Redness
- Warmth

## EMOTIONAL STATUS & BONDING

- Assess for bonding between mom & baby
- Educate mom about signs of postpartum blues & depression

### POSTPARTUM BLUES

↑ emotions, sensitivity & crying up to 2 weeks following delivery

### POSTPARTUM DEPRESSION

↑ feelings of hopelessness & sadness to point where it affects care for self & baby

# POSTPARTUM HEMORRHAGE

## WHAT IS IT?

Significant loss of blood after delivery of baby

**VAGINAL BIRTH:** >500mL
**CESAREAN BIRTH:** >1000mL

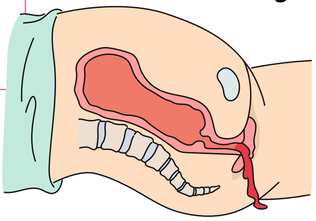
**PRIMARY PPH**

Hemorrhaging within 24 hours after delivery

**SECONDARY PPH**

Hemorrhaging after 24 hours of delivery

After delivery, the process of **INVOLUTION** begins (lasts about 6 weeks)



Process of uterus regressing back to pre-pregnancy size causes uterus to clamp down on placental arteries, **STOPPING BLEEDING**

If something interferes with this process, can lead to **SEVERE BLEEDING**

## CAUSES

4 T's

### TONE

AKA UTERINE ATONY

Lack of uterine tone

- Uterine fatigue
  - Prolonged labor
- Repeated uterine distention
  - Multiple pregnancies
  - **Bladder distention**

MOST COMMON CAUSE

### TRAUMA

Damage to reproductive tissues/organs including:

- Uterus
- Cervix
- Vagina
- Perineum

### TISSUES

Placental fragments retained by uterus

↓

Interferes with contractions which leads to **UTERINE ATONY**

### THROMBIN

Mother has underlying disorder prevent clotting

- Von Willebrand
- DIC
- Placenta accreta

## RISK FACTORS

- Placental disorders
  - Placenta previa
  - Placental abruption
- Polyhydramnios
- Multiple pregnancies
- Macrosomic newborn
- Infection
- Prolonged Labor
- C-section

## SYMPTOMS

- Uncontrolled overt bleeding (blood is seen)
- Occult bleeding (blood pooling inside)
- Back pain (from blood pooling internally)
- Hypovolemic shock
  - Tachycardia
  - Hypotension
  - Dizziness
  - Shortness of breath
  - Cold, clammy skin
- Fundus above expected level

## TREATMENT

### GIVEN 1ST PITOCIN

**Oxytocin**

Stimulates uterus to contract to stop bleeding

OTHER INTERVENTIONS

- Fundal massage
- Blood products
- Oxygen
- IV Fluids

### GIVEN 2ND METHERGINE

**Methylergometrine**

Vasocontricts to stop & control bleeding

**CONTRAINDICATED IN PATIENTS WITH HYPERTENSION**

Vasoconstriction=↑ BP

### GIVEN 3RD HEMABATE

**Carboprost**

Prostaglandin used to initiate contractions to control bleeding

**CONTRAINDICATED IN PATIENTS WITH ASTHMA**

Can cause **bronchospasm**

### GIVEN 4TH MISOPROSTOL

**Cytotec**

Prostaglandin used to initiate contractions to control bleeding

**HIGHER RISK OF SIDE EFFECTS**

Only used if neccessary

# NEWBORN CARE

## TOP PRIORITIES AFTER DELIVERY:

① **Airway**
② **Thermoregulation**

→ Keep both in mind while performing newborn assessment!

## IMMEDIATELY AFTER DELIVERY

- ⋆ Assess & monitor airway
- ⋆ Dry & wrap newborn in warm blanket
- ⋆ APGAR & 1 & 5 minutes
- ⋆ Newborn identification & registration
- ⋆ Encourage skin-to-skin contact
- ⋆ Vitamin K, erythromycin & hep B vaccine

## AIRWAY

- → Suction mouth & nose with bulb syringe
- → If infant doesn't breathe spontaneously, stimulate cry by:
  - ▸ Slapping heels
  - ▸ Lightly tapping buttocks
  - ▸ Gently rubbing back

CAN CAUSE ASPIRATION

NEVER STIMULATE CRY BEFORE DRAINING SECRETIONS

## THERMOREGULATION

- → Dry newborn immediately & wrap in warm blanket
- → Place cap on head
- → Move quickly to avoid exposure to infant

**BABIES LOSE HEAT QUICKLY!**
BSA is about 3x adults & cannot regulate temperature

## HOW BABIES LOSE HEAT

### CONDUCTION

Heat loss to colder surface baby is in direct contact with

EXAMPLE

- ▸ Cold stethoscope
- ▸ Cold exam table

### CONVECTION

Heat loss to cooler currents of air

EXAMPLE

- ▸ Fan
- ▸ Air conditioner

### RADIATION

Heat loss to cooler object nearby

EXAMPLE

- ▸ Air conditioner
- ▸ Window

### EVAPORATION

Heat loss when water evaporates from skin

EXAMPLE

- ▸ Wet after birth or bath

## UMBILICAL CORD CARE

- → Keep cord & surrounding area dry
- → Wash hands before touching cord
- → Only sponge baths until cord falls off
- → Keep diaper folded below cord

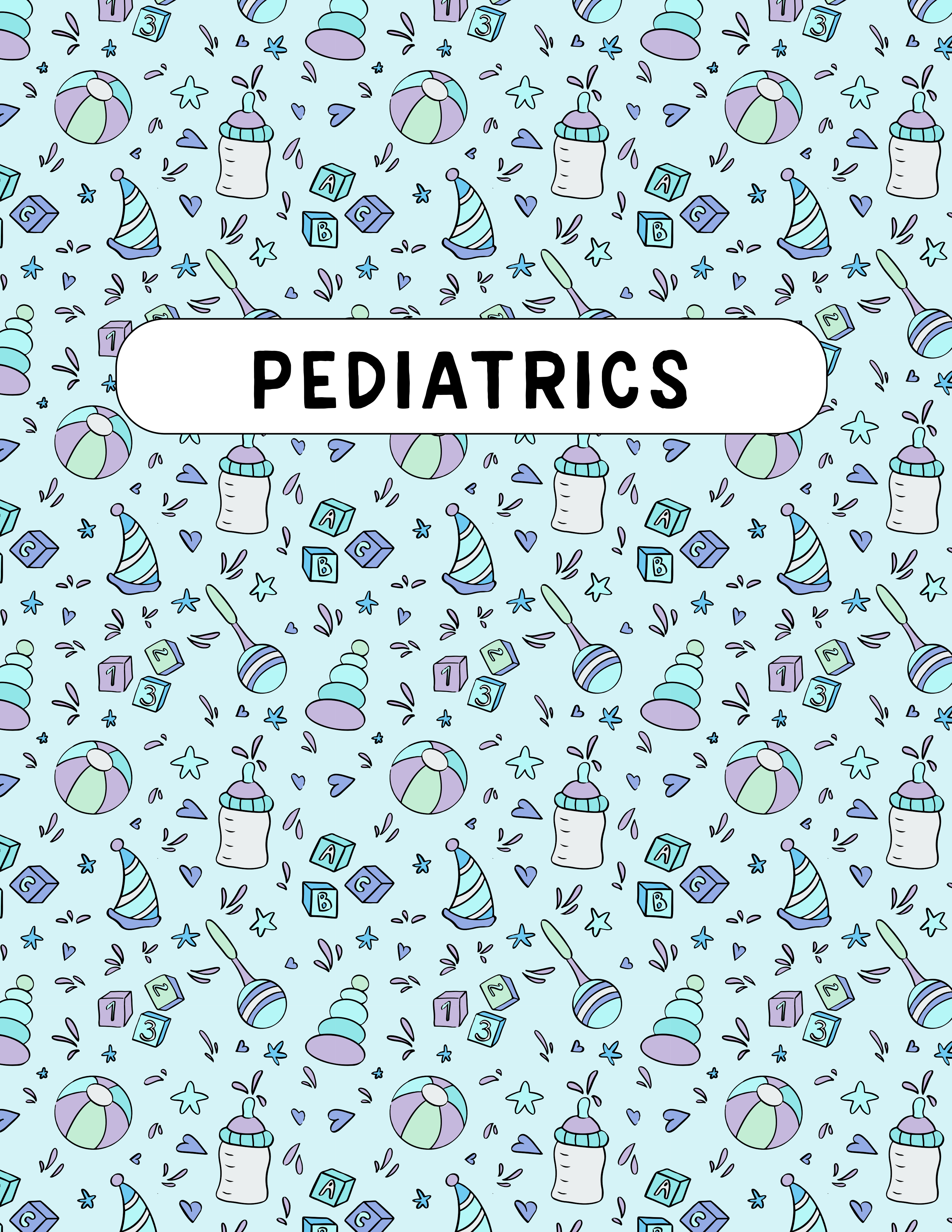
## NUTRITION

### INITIAL FEEDING

**Breast-fed:** can be fed immediately after birth

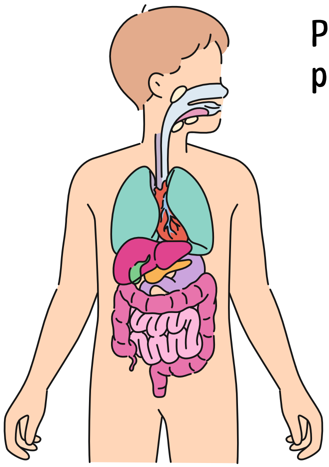
**Bottle-fed:** can be fed 2-4 hours of age

★ Feeding should always be **after bathing** to prevent aspiration



# PEDIATRICS

# PEDIATRIC PHYSIOLOGY



Pediatric physiology has key differences when compared to adult physiology & comes with increased risks for disorders such as:

① **Airway obstruction**
② **Infection**
③ **Hypothermia**
④ **Dehydration**
⑤ **Hypoglycemia**
⑥ **Injury**

Important to keep in mind when using critical thinking & remember to always prioritize ABC's !

(airway, breathing, circulation)

## CNS

- Brain & nervous system begin to develop at 6 weeks
- Incomplete myelinization at birth
- Myelinization occurs in head to tail direction (Cephalocaudal)
- Vision not fully developed until 3-5 years old

## RESPIRATORY

- Infants are obligatory nasal breathers
- Smaller, shorter airways
  - More susceptible to airway obstruction
- Tongue larger in proportion to mouth
  - Can obstruct airway when unconcious
- ↑ Metabolic rate & ↑ O2 requirements
- Poorly developed intercostal muscles (tire quickly)

## CARDIOVASCULAR

- Larger heart in relation to body size
- ↑ HR to ↑ CO
- ↑ BSA= ↑ fluid loss through evaporation
  - require more fluids to maintain circulatory volume
- Small veins + ↑ SQ tissue (IV access can be difficult)
- ↑ Metabolic rate= ↑ cardiac workload

## RENAL

- ↓ GFR
- ↓ ability to concentrate urine
  - ↑ risk of dehydration
- Immature tubular function
  - ↑ risk of hyponatremia

## GASTROINTESTINAL

- ↑ glucose requirements + poor glucose storage
  - ↑ risk of hypoglycemia
- Larger colon in relation to body size
  - ↑ fluid loss
- Cylindrical-shaped abdomen
  - Less protection for vital organs

## SKIN

- Blood vessels closer to skin's surface
  - Lose heat easily
- Epidermis 20-30% thinner than adults
- Cells and collagen fibers are smaller and thinner
  - More suseptible to dry skin

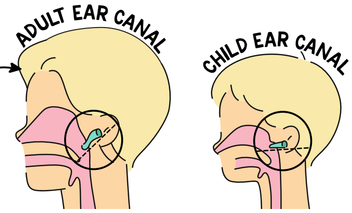
## IMMUNE

- Immature immune system
  - ↑ risk of infection
- ↓ inflammatory response
- Limited exposure to diseases (lose immunity from maternal antibodies)

## EARS

- Eustachian tubes are wide, short & flat
  - Makes drainage difficult (fluid stays stagnant) & harbors bacteria

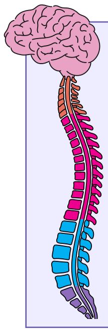
↑ RISK OF EAR INFECTION



## MUSCULOSKELTAL

- ↓ muscle tone & coordination
- Bones soft until puberty
  - Serious injuries can occur without fractures
- Growth plates between middle & end of long bones
  - If fractured require special attention
- Infants born with more bones than adults (bones fuse together as they grow)

## HEAD, BRAIN & SPINAL CORD



- Thinner cranial bones (↑ risk of hemorrhage)
- Temperature regulation not well developed (↑ risk of hypothermia)
- Spine is highly mobile (↑ risk of cervical spine injury)
- Incomplete motor development (↑ risk of falls)
- Larger head-to-body ratio (more susceptible to head injuries)

# PEDIATRIC CPR

## 1 CHECK RESPONSIVENESS

**Infant <1 year old:** Flick bottom of foot

**Child >1 year old:** "Hey hey are you okay?"

## 2 CALL FOR HELP

→ Shout for nearby help/ activate emergency response
→ Delegate someone to call 911 & get AED

## 3 CHECK PULSE & BREATHING (SIMULTANEOUSLY)

**Infant <1 year old:** Check brachial
**Child >1 year old:** Check carotid

**Breathing:** Gasping or apnea **not** normal

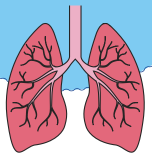
NO MORE THAN
10 SECOND
ASSESSMENT!

## 4 INITIATE CHEST COMPRESSIONS

→ Remove clothes to visualize chest if possible
→ 2 minutes of CPR (before retrieving AED)
→ Rate 100-120 compressions/minute
→ Allow for full chest recoil between compressions

Primary cardiac arrest is very rare in infants & children

Commonly stems from
RESPIRATORY CAUSE



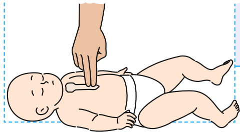
RESCUE-BREATHING IS VERY IMPORTANT!

## HAND PLACEMENT

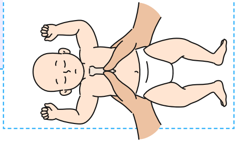
### INFANT

Use 2 fingers or 2 thumbs on the sternum
(TWO FINGER TECHNIQUE)

TWO FINGER TECHNIQUE

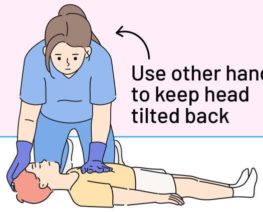


TWO THUMB TECHNIQUE



### SMALL CHILD

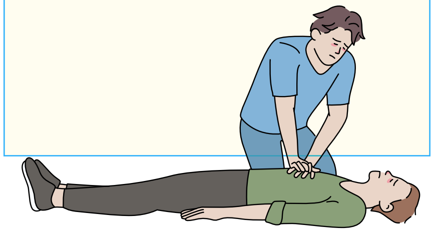
Use heel of one hand on the sternum
(ONE HAND TECHNIQUE)



Use other hand to keep head tilted back

### LARGER CHILD

Use two heels of hands on the sternum (same as adults)



## RESCUE BREATHING

### INFANT

→ Cover infants mouth **and** nose with airtight seal
→ Watch for chest rise

Infants have *much* smaller lungs so require less than a full breath to fill them

**SINGLE RESCUER**
**30:2**
Compression-to-breath ratio

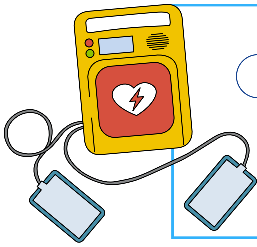
**TWO RESCUERS**
**15:2**
Compression-to-breath ratio

### SMALL & LARGER CHILDREN

→ Head-tilt/ chin lift method
→ Watch for chest rise

## AED PAD PLACEMENT

USE AED AS SOON AS IT ARRIVES



### INFANT <1 YEAR OLD

Manual defibrillation recommended
→ 1 pediatric pad on chest
→ 1 pediatric pad on back

### CHILD 1–8 YEARS OLD

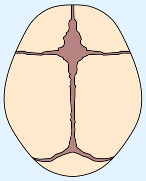
If pediatric pads not available:
→ 1 adult pad on chest
→ 1 adult pad on back

### CHILD >8 YEARS OLD

Placement same as adults
→ 1 pad high right
→ 1 pad low left

# PEDIATRIC MILESTONES
## INFANT

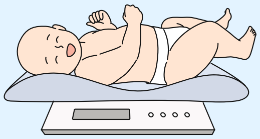
### FONTANELLES



**ANTERIOR FONTANEL**
Closes by 18 months

**POSTERIOR FONTANEL**
Closes by 2 months

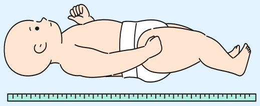
### WEIGHT



**6 MONTHS**
**Doubles** from birth weight

**12 MONTHS**
**Triples** from birth weight

### LENGTH

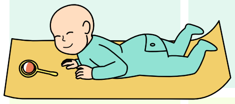
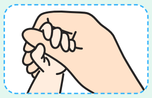
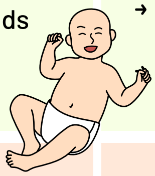
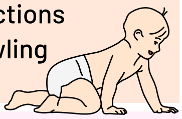
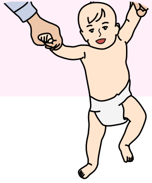


Grows **1/2–1 INCH** every month until 6 months

Grows **50%** by 12 months

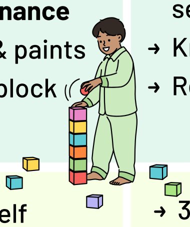
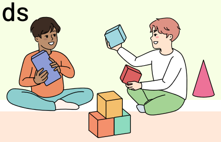
### TEETH

Lower central incisors erupt around **10 MONTHS**
(first teeth to grow)

| | GROSS MOTOR | FINE MOTOR | LANGUAGE | SOCIAL/ COGNITIVE |
|---|---|---|---|---|
| **1 MONTH** | → Attempts to hold head up in prone position<br>→ Turns head side to side | Fisted hands | Cries when hungry or upset | → Looks at parent's face when speaking<br>→ Develops recognition between different parent's voices |
| **2–3 MONTHS**  | → Able to maintain head upright<br>→ Smoother movements of extremities | → Smiles<br>→ **Grasp reflex**  | → Cooing and gurgling sounds<br>→ Turns head towards sound | Smiles at people as response mechanism |
| **4–5 MONTHS** | → Rolls tummy to back<br>→ Sits with support<br>→ Head leads body when pulled to sit | → **Palmar grasp**<br>→ Brings hands to mouth<br>→ Reaches for objects | → Laughs<br>→ Babbles<br>→ Copies sounds heard  | → Cries when playing stops<br>→ Copies smiling expression<br>→ Calmed by parent's voices |
| **6–9 MONTHS** | → Sits unsupported<br>→ Tripod sits<br>→ Rolls in both directions<br>→ Crawling  | → Moves objects from one hand to another<br>→ Rakes object with whole hand<br>→ Object permanence | → Responds to own name<br>→ Strings vowels together<br>→ Starts to say consanants | → **Stranger anxiety**<br>→ Responds to emotions of others |
| **10–12 MONTHS**  | → Pulls to stand<br>→ Walks with assistance | → Mature pincer grasp<br>→ Offers objects to others | → Simple words like “mama” & “dada”<br>→ Understands “no” | → Plays peek-a-boo<br>→ Starts to understand cause & effect |

# PEDIATRIC MILESTONES

## TODDLER TO PRESCHOOLER

| | GROSS MOTOR | FINE MOTOR | LANGUAGE | SOCIAL/ COGNITIVE |
|---|---|---|---|---|
| **18 MONTHS** | → **Walks without assistance**<br>→ Climbs stairs with assistance<br>→ Can jump in place<br>→ Pulls toys while walking | → Feeds self finger foods<br>→ Turns book pages<br>→ Scribbles<br>→ Can drink from cup | → Understands 200 words<br>→ Can identify familiar objects<br>→ Follows simple verbal commands | → Temper tantrums<br>→ Establishes ownership, saying “MINE!”<br>→ Pretend plays |
| **2 YEARS** | → **Can kick ball**<br>→ Runs without falling<br>→ Walks stairs without assistance (one step at a time)<br>→ Climbs up & down from furniture | → **Shows right or left hand dominance**<br>→ Scribbles & paints<br>→ Builds 6-7 block tower<br> | → 2 to 4 word sentences<br>→ Knows 300+ words<br>→ Recites own name | → **Parallel play**<br>→ Gets excited with other children around<br>→ Starts to gain independence from parents |
| **3 YEARS** | → Pedals tricycle<br>→ Can jump forward<br>→ Bends over without falling | → Undresses self<br>→ Copies circle<br>→ Grips pen in writing position<br>→ Screws/ unscrews lids | → 3 to 4 word sentences<br>→ Always asks WHY<br>→ Knows age<br>→ Follows 2 to 3 step instructions | → **Associative play**<br>→ Potty training<br>→ Has imaginary friends<br> |
| **4 YEARS** | → Hops on one foot<br>→ Jumps and climbs<br>→ Can catch a ball<br>→ Alternates feet while going up/down stairs | → Draws a square<br>→ Pours drink<br>→ Can use scissors<br>→ Laces shoes | → Sings song from memory<br>→ Tells stories<br>→ Recites first and last name<br>→ Knows 1500+ words | → **Prefers to play with other children**<br>→ Begins creative/ make believe play |
| **5 YEARS** | → Can balance on one foot 10 seconds or longer<br>→ May learn to skate or swim | → Draws person with at least 6 body parts<br>→ Uses fork, spoon & knife well<br>→ Prints some letters | → Knows 2000+ words<br>→ Can count to 10<br>→ Most speech can be understood<br>→ Talks about past, present & future | → Takes turns playing games with other children<br>→ Does simple chores at home |

## SAFETY

### CARSEAT

**REAR FACING**
Newborn to 4 years old or until outgrows seat

**FRONT FACING**
Preschooler to school age or until child outgrows seat

**BOOSTER SEAT**
School age until fits in seat belt & can properly follow instructions

### INFANTS

**HIGH RISK FOR:**

- Burns
- Airway obstruction
- Falls

- Check temperature of bath water & formula before using
- No toys with small, detachable parts or sharp edges
- Never leave infant on raised surface

### TODDLERS

**HIGH RISK FOR:**

- Poisoning
- Drowning
- Injury

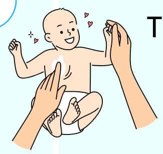
- Keep cleaning products and medications locked in cupboards
- Supervise in tub
- Always keep hot pots with handles turned inward

### PRESCHOOLERS

**BEST AGE FOR SAFETY EDUCATION**

- Don't run with food in mouth
- Play in safe areas
- Don't play with strangers & keep parents informed
- No small objects in mouth, nose or ears
- Look both ways before crossing the street

# ERIKSON'S THEORY

| AGE | CONFLICT | IMPORTANT EVENTS | FAVORABLE VS. UNFAVORABLE |
|---|---|---|---|
| **INFANCY**<br>Birth-18 Months  | Trust vs. Mistrust | Feeding | **FAVORABLE**<br>Faith & trust in others<br>**UNFAVORABLE**<br>Suspicion or fear of people/events/future |
| **EARLY CHILDHOOD**<br>2-3 Years | Autonomy vs. Shame and Doubt | Toilet Training | **FAVORABLE**<br>Feeling of self-control & independence<br>**UNFAVORABLE**<br>Feeling of shame and self-doubt |
| **PRESCHOOL**<br>3-5 Years | Initiative vs. Guilt | Exploration | **FAVORABLE**<br>Ability to be assertive & find sense of purpose<br>**UNFAVORABLE**<br>Feeling guilt and inadequacy |
| **SCHOOL AGE**<br>6-11 Years | Industry vs. Inferiority | School | **FAVORABLE**<br>Feeling of competence<br>**UNFAVORABLE**<br>Feeling of inferiority |
| **ADOLESCENT**<br>12-18 Years | Identity vs. Role Confusion | Social Relationships | **FAVORABLE**<br>Developed sense of identity & able to stay true to oneself<br>**UNFAVORABLE**<br>Role confusion & weak sense of self |
| **YOUNG ADULTHOOD**<br>19-40 Years | Intimacy vs. Isolation | Intimate Relationships | **FAVORABLE**<br>Strong relationships<br>**UNFAVORABLE**<br>Loneliness & isolation |
| **MIDDLE ADULTHOOD**<br>40-60 Years | Generativity vs. Stagnation | Family & Occupation | **FAVORABLE**<br>Feelings of usefulness & accomplishment<br>**UNFAVORABLE**<br>Shallow involvement in the world |
| **MATURITY**<br>65 Years- Death | Integrity vs. Despair | Reflection on Life | **FAVORABLE**<br>Sense of integrity, fulfillment, & acceptance in death<br>**UNFAVORABLE**<br>Dissatisfaction or despair |

# PIAGET'S STAGES OF DEVELOPMENT

## SENSIMOTOR STAGE

**BIRTH–2 YEARS OLD**

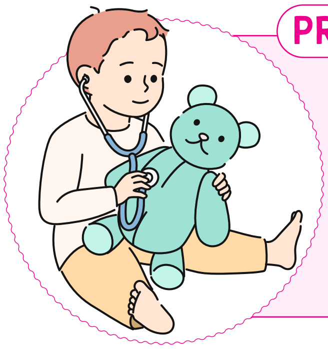
Thinks in present moment through senses

- → Interacting with the environment
- → Imitates activities
- → Reflexes & motor development
- → **Object permanence developed**

Understands objects are still there even if you can't see them

**EDUCATION**

Always teach child what you are doing **as you are doing it**



## PREOPERATIONAL STAGE

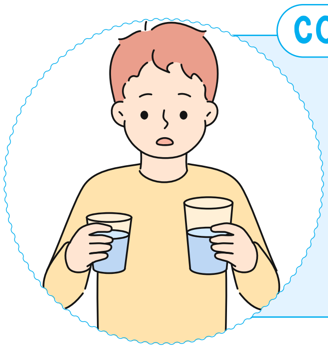
**3–6 YEARS OLD**

Understands the future and the past

- → Symbolic thinking
- → Imagination & magical thinking
- → Does not understand cause & effect
  - **Example:** May think them being adopted is ***their fault***

**EDUCATION**

Always teach child what you are going to do **before you do it**



## CONCRETE OPERATIONAL STAGE

**7–11 YEARS OLD**

Skills learning stage

- → Problem solving
- → Rigid thinking ("only one way to do something")
- → Limited abstract thoughts
- → Recognizes perspective of others

**EDUCATION**

Teach days before doing something + **teach skills with demonstration**

## FORMAL OPERATIONAL STAGE

**12–15 YEARS OLD**

Adult learners: developing **abstract thought**

- → Logical thinking & decision making
- → Multi-tasking
- → Developing **moral reasoning**
- → Understands the consequences of actions

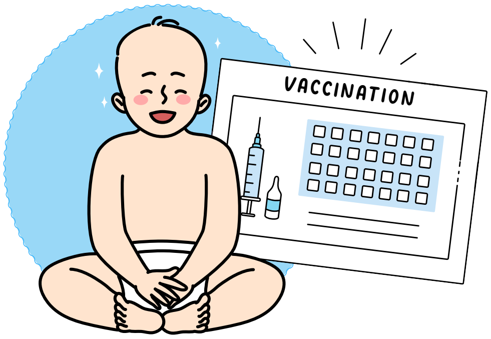
NON-COMPLIANT & RISK TAKING BEHAVIOR

**EDUCATION**

Teach days before doing something + **teach skills with demonstration**

→ TEACH LIKE AN ADULT

# VACCINE SCHEDULE



## BIRTH

Hepatitis B 1ST

REMEMBER B FOR BIRTH

## 2 MONTHS

REMEMBER BE DR. HIP

- B Hepatitis **B** 2ND
- D DTAP 1ST
- R Rotavirus 1ST
- H HIB 1ST
- I Inactivated poliovirus 1ST
- P Pneumococcal 1ST

## 4 MONTHS

REMEMBER DR. HIP

- D DTAP 2ND
- R Rotavirus 2ND
- H HIB 2ND
- I Inactivated poliovirus 2ND
- P Pneumococcal 2ND

## 6 MONTHS

REMEMBER BE DR. HIP

- B Hepatitis **B** 3RD
- D DTAP 3RD
- R Rotavirus 3RD
- H HIB 3RD
- I Inactivated poliovirus 3RD
- P Pneumococcal 3RD

## 12 MONTHS

REMEMBER HI VAMP

- H Hepatitis B 4TH
- I Influenza YEARLY
- V Varicella 1ST
- A Hepatitis **A** 1ST
- M MMR 1ST
- P Pneumococcal 4TH

## 18 MONTHS

REMEMBER HID

- H Hepatitis A 2ND
  Hepatitis B 3RD
- I Inactivated polio 3RD
- D DTAP 4TH

## 4–6 YEARS

REMEMBER VERY DIM

- V Varicella 2ND
- D DTAP 5TH
- I Inactivated polio 4TH
- M MMR 2ND

## 11–12 YEARS

REMEMBER MYTH

- M Meningococcal 4TH
- Y Yearly flu vaccine YEARLY
- T TDAP EVERY 10 YEARS
- H HPV 1ST

**DTAP** & **TDAP** are the SAME vaccine but dosed for different age groups

**DTAP:** <7 years old
**TDAP:** >7 years old

## TERMS

**HIB:** Haemophilus influenzae type B
**MMR:** Measles, mumps and rubella
**DTAP:** Diphtheria, tetanus & pertussis
**TDAP:** Tetanus, diphtheria, pertussis
**HPV:** Human papillomavirus

# PEDIATRIC VITAL SIGNS

| AGE | HR | RR | BP | TEMP |
|---|---|---|---|---|
| **NEWBORN**<br>1-28 days | 110-180 | 40-60 | **Systolic:** 60-90<br>**Diastolic:** 20-60 | 97.5-99.6 F<br>or<br>36.4- 37.5 C<br>Can be taken:<br>• Oral<br>• Axillary<br>• Temporal<br>• Rectal (most accurate)<br>The younger the child, the higher the baseline temp due to higher body surface area |
| **INFANT**<br>1-12 months | 100-160 | 30-50 | **Systolic:** 70-105<br>**Diastolic:** 35-55 | |
| **TODDLER**<br>1-3 years | 90-150 | 20-40 | **Systolic:** 85-105<br>**Diastolic:** 40-65 | |
| **PRESCHOOL**<br>3-6 years | 80-140 | 20-40 | **Systolic:** 90-110<br>**Diastolic:** 45-70 | |
| **SCHOOL AGE**<br>6-12 years | 70-120 | 20-30 | **Systolic:** 97-120<br>**Diastolic:** 55-70 | |
| **ADOLESCENT**<br>12-18 years | 60-100 | 12-20 | **Systolic:** 110-130<br>**Diastolic:** 65-80 | |

## PAIN

Always make sure to use appropriate pain scale **based on age**

### 0–6 MONTHS

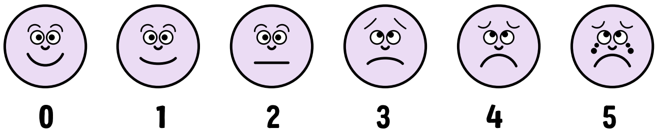
| CRIES SCALE | 0 POINTS | 1 POINT | 2 POINTS |
|---|---|---|---|
| **C**rying | None | High-pitched | Inconsolable |
| **R**equires 02 | None | < 30% Fi02 needed | > 30% Fi02 needed |
| **I**ncreased VS | Normal VS | ↑ BP & HR <20% | ↑ BP & HR >20% |
| **E**xpression | Normal | Grimace | Grimace & grunt |
| **S**leeplessness | None | Awake frequently | Awake constantly |

### 2 MONTHS– 7 YEARS

| FLACC SCALE | 0 POINTS | 1 POINT | 2 POINTS |
|---|---|---|---|
| **F**ace | No particular expression | Occasional grimace/frown/ withdrawn | Frequent quivering or tense |
| **L**egs | Normal | Restless, tense | Kicking or legs drawn up |
| **A**ctivity | Normal | Squirming | Arched or rigid |
| **C**ry | None | Moans or whimpers | Crying or screaming |
| **C**onsolability | Content | Can be reassured | Difficult to console |

### 3+ YEARS OLD

**FACES SCALE**

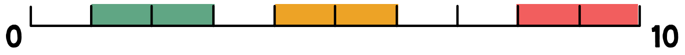


**SELF REPORTING**

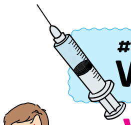
### 5+ YEARS OLD

**NUMERIC SCALE**

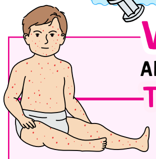
**FOR ADOLESCENTS:** Ensure **privacy**



# COMMUNICABLE DISEASES



**#1 PREVENTION IS VACCINATION**



## VARICELLA

AKA CHICKEN POX

### TRANSMISSION

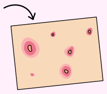
Airborne

### INCUBATION PERIOD

14-16 days after transmission

### SYMPTOMS

- Rash
  - **1st phase:** Macule → papule
  - **2nd Phase:** Vesicles (becomes itchy)
  - **3rd Phase:** Crusts & scabs



- Fever
- Headache
- Malaise

### TREATMENT

- Acyclovir
- Varicella immune globulin (for high risk children)
- Skin care (calamine lotion & **avoid itching**)

### COMPLICATIONS

- Hemorrhagic varicella
- Encephalitis
- Pneumonia

KOPLIK'S SPOTS

## RUBEOLA

AKA MEASLES

### TRANSMISSION

Droplet

### INCUBATION PERIOD

11-12 days after transmission

### SYMPTOMS

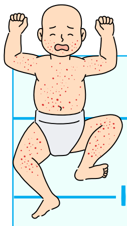
- High fever (>104 F)
- Prodromal phase symptoms
  - Malaise
  - Gradually rising fever
  - 3 C'S Conjunctivitis, Cough & Coryza (rhinitis)
- Widespread rash (lasts 3-5 days)
- **Koplik's spots:** small bumps inside cheeks

### TREATMENT

- Hydration
- Vitamin A
- Antibiotics for secondary infections

### COMPLICATIONS

- **Ear infections**
- Encephalitis
- Pneumonia



## RUBELLA

AKA GERMAN MEASLES

### TRANSMISSION

Airborne

### INCUBATION PERIOD

12-23 days after transmission

### SYMPTOMS

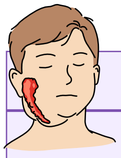
- Prodromal phase symptoms
  - Low grade fever
  - Sore throat
  - Conjunctivitis
  - Malaise
- Maculopapular rash that starts on face & spread to extremities
- **Forcheimer spots** on soft palate

### TREATMENT

- Supportive care
  - Rest
  - Fluids
  - Antipyretics

### COMPLICATIONS

- Pneumonia
- Myocarditis
- Encephalitis



## MUMPS

### TRANSMISSION

Airborne

### INCUBATION PERIOD

12-25 days after transmission

### SYMPTOMS

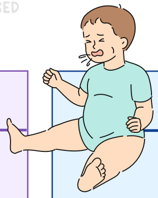
- Parotitis: swelling of salivary glands
- Flu-like symptoms
  - Fever
  - Headache
  - Myalgia
  - Malaise

### TREATMENT

- Supportive care
  - Rest
  - Fluids
  - Antipyretics

### COMPLICATIONS

- Swelling of testicles or ovaries
- Pancreatitis
- Encephalitis



## PERTUSSIS

AKA WHOOPING COUGH

### TRANSMISSION

Airborne

### INCUBATION PERIOD

7-10 days after transmission

### SYMPTOMS

**Catarrhal Stage (1-2 weeks)**

- Mild upper respiratory infection
- Mild, non-productive cough

**Paroxysmal Stage**

- Severe, forceful cough

**Convalescent Stage**

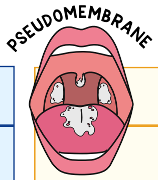
- Chronic residual cough (2-3 weeks)

### TREATMENT

- Antibiotics
- IV Fluids
- Oxygen support
- **May require hospitalization**

### COMPLICATIONS

- Pneumonia
- Encephalitis
- Seizures



## DIPTHERIA

### TRANSMISSION

Airborne

### INCUBATION PERIOD

2-5 days after transmission

### SYMPTOMS

- Low-grade fever
- Malaise
- Sore throat
- Bull neck (swollen neck)
- Pseudomembrane
  - Thick, gray membrane that starts on soft palate, tonsils, tongue

  Can extend to larynx & trachea & cause airway obstruction

### TREATMENT

- Antitoxin
- Antibiotics
- Antipyretics
- **May require hospitalization**

### COMPLICATIONS

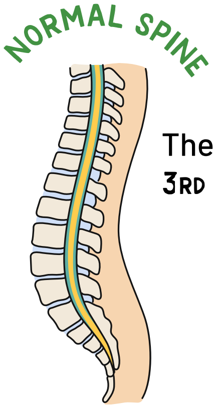
- Myocarditis
- Polyneuropathy
- Airway obstruction

# SPINA BIFIDA

## WHAT IS IT?

Spina Bifida is part of a group of defects called **NEURAL TUBE DEFECTS** in which the neural tube fails to close completely

**NEURAL TUBE:** Embryonic brain & spinal cord



The neural tube closes at the **3RD TO 4TH WEEK OF GESTATION**

## CAUSES

**CAUSE NOT KNOWN**

Thought to result from factors that interrupt normal CNS development

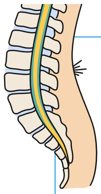
- → Folic acid deficiency
- → Malnutrition
- → Diabetes
- → Genetics
- → Drug & alcohol use
- → Radiation exposure
- → Certain medications
- → Obesity

## DIAGNOSTICS

**AMNIOCENTESIS:** will show ↑ alpha fetoprotein

**ULTRASOUND:** may show incomplete neural tube

## CLASSIFICATIONS



MOST COMMON

### SPINA BIFIDA OCCULTA

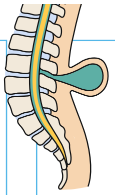
Defect of the vertebrae without the protrusion of the meninges or spinal cord

**TYPICALLY ASYMPTOMATIC**

**Over defect may have:**

- → Tuft of hair
- → Dimpling
- → Discoloration

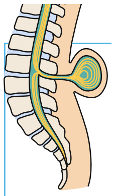
**NO TREATMENT NECESSARY IF ASYMPTOMATIC**



### MENINGOCELE

Hernial protrusion of meninges & spinal fluid in cystic sac from spine

- → Usually covered by thin layer of skin
- → Little or no nerve damage present
- → **Spinal cord NOT in sac**

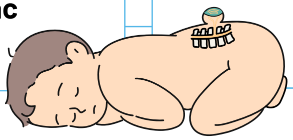


MOST SEVERE

### MYELOMENINGOCELE

Hernial protrusion of spinal cord, meninges & nerve roots in sac

- → Visible sac-like cyst outside spine
- → Motor & sensory dysfunction **below spine**



## NURSING INTERVENTIONS

**For meningocele & myelomeningocele**

- → **Infection prevention**
- → Prevent contractures
- → Maintain skin integrity
- → Promote family coping

**RISK FOR MENINGITIS**

## TREATMENT

Surgical correction of lesion within **24-48 hours of birth**

Surgery will NOT regain motor & sensory dysfunction associated with **myelomeningocele**

**MAY CAUSE:**

- Bladder & bowel incontinence
- Paralysis
- Hydrocephalus

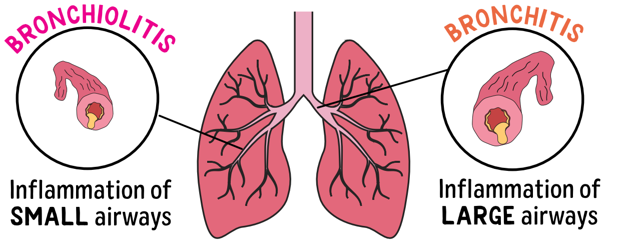
# BRONCHIOLITIS

## WHAT IS IT?

Inflammation of the small airways in the lungs called the **BRONCHIOLES**

Most commonly caused by viral infection
**RESPIRATORY SYNCTIAL VIRUS (RSV)**

**Also caused by:**
- Adenovirus
- Flu
- Mycoplasma pneumoniae



Inflammation of **SMALL** airways
(Mainly affects younger children)

Inflammation of **LARGE** airways
(Mainly affects older children & adults)

## RISK FACTORS

- Age
  - Mostly affects children < 2 yrs old
  - Infants <3 months highest risk
- Premature birth
- Immunocompromised children
- Congenital heart disease
- Attending crowded places like daycare

## RSV TRANSMISSION

Transmitted through droplet

**INCUBATION PERIOD**
2-6 days after transmission

**EFFECTS**
Invades bronchioles & attracts immune cells, leading to inflammation & ↑ mucous production

## SYMPTOMS

Starts in **upper airway**
(NASAL CAVITY, SINUSES, PHARYNX, LARYNX)

Common cold symptoms
- Congestion
- Runny nose
- Fever
- Headache
- Mild cough

Excess mucous blocks airway & causes alveoli to deflate leading to poor gas exchange

➜

Progresses to **lower airway**
(TRACHEA, BRONCHI, BRONCHIOLES, ALVEOLI)

- Tachypnea
- Wheezing
- Crackles
- Dyspnea

CAN LEAD TO SEVERE SYMPTOMS:
- Lethargy
- Irritability
- Dehydration
- Apnea
- Hypoxia

EMERGENCY ⚠

## TREATMENT

**USUALLY SELF LIMITING ILLNESS**

**SUPPORTIVE CARE**
- Hydration
- Nasal suctioning
- Rest
- Cool mist humidifier
- Keep head elevated
- Droplet precautions
- Antipyretics
- Oxygen
- **Hospitalization only required for severe symptoms**

## DIAGNOSTICS

**RAPID ANTIGEN TEST:** nasal swab

**CHEST X-RAY**

## TIPS

- *Very* contagious
- If the patient must share a room with another patient, **the patient must also have RSV**

# CROUP

## WHAT IS IT?

Viral respiratory infection causing inflammation of the **LARYNX, TRACHEA AND BRONCHI**

→ AKA **LARYNGOTRACHEOBRONCHITIS**

Most commonly caused by viral infection

**PARAINFLUENZA VIRUS**

→ **Also caused by:**
- RSV
- Adenovirus
- Influenza A or B

## RISK FACTORS

- → Children ages 3 months- 6 years old
- → More common in fall or winter
- → Family history

## SYMPTOMS

### INITIAL SIGNS

Flu-like symptoms

- → Low grade fever
- → Runny nose
- → Congestion

### PROGRESSES TO:

- → Inspiratory stridor
- → Hoarseness
- → **Seal bark cough**

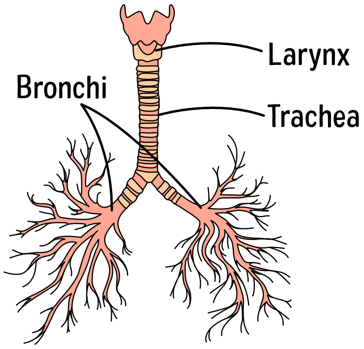
Symptoms mainly occur at **NIGHT**

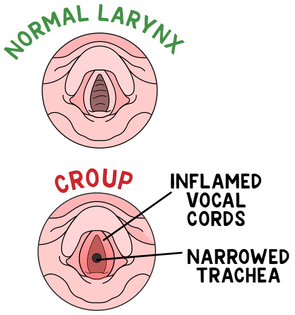
### SEVERE SYMPTOMS

- → Dyspnea
- → Nasal flaring
- → Retractions
- → Cyanosis
- → Restlessness & agitation

**EMERGENCY**
Need to go to hospital!

© NURSE READY





## PATHO

Viral droplets enter body infecting nasopharynx

↓

Spreads to larynx, trachea & bronchi

↓

Inflammatory response causes edema & mucous leading to **narrowing of subglottic area (trachea & vocal cords)**

## DIAGNOSTICS

**USUALLY BASED OFF SYMPTOMS**

→ Seal bark cough & stridor

**CHEST X-RAY**: may show "steeple sign" (inverted V shape below vocal cords)

## TREATMENT

### MEDICATIONS

- → Corticosteroids
  - ↓ inflammation
- → Bronchodilators
  - Racemic epinephrine
  - Albuterol

### SUPPORTIVE CARE

- → Humidified air
- → Rest
- → Fluids
- → Promote calm environment
- → Antipyretics

# EPIGLOTTITIS

## WHAT IS IT?

Inflammation of the **EPIGLOTTIS**

Can lead to **AIRWAY OBSTRUCTION**

**MEDICAL EMERGENCY** ⚠

## RISK FACTORS & CAUSES

Most common cause:

**HAEMOPHILUS INFLUENZAE TYPE B**

- → Also caused by streptococcus pneumonia
- → Most common in children age 2-5 years old

Contagious if from bacterial, fungal or viral infection

**SPREADS VIA DROPLETS**

## SYMPTOMS

### 3 D'S

- ▶ **Dysphagia**
- ▶ **Drooling**
- ▶ **Distress/ anxiety**

- → High fever
- → Stridor
- → Retractions
- → Sitting in tripod position
- → Cherry red inflamed epiglottis

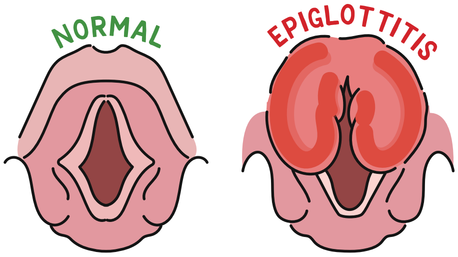
**RAPID ONSET OF SYMPTOMS**

### CAN LEAD TO COMPLETE AIRWAY OBSTRUCTION!

- → Cyanosis
- → Hypoxia
- → Restlessness & agitation
- → Nasal flaring
- → Loss of conciousness
- → Absent cough

**DO NOT PLACE ANYTHING IN PATIENT'S MOUTH**

↳ Can cause laryngeal spasm & block airway!



## FUNCTION OF EPIGLOTTIS

The **epiglottis** is a flap at the back of the throat that covers the trachea

**CLOSES** during swallowing

Prevents food & fluids from entering trachea

**OPENS** during breathing

Allows air to move in & out of lungs

## DIAGNOSTICS

**THROAT CULTURE:** assess for bacteria/ virus

**NECK X-RAY:** will show enlarged epiglottis that looks like thumbprint

**LARYNGOSCOPY:** visualize airway for swelling

## TREATMENT

**IMMEDIATE care needed to prevent airway obstruction**

- → **AIRWAY MANAGEMENT**
- → Antibiotics: for infectious cause
- → Antipyretics: ↓ fever
- → Corticosteroids: ↓ swelling
- → IV fluids

## NURSING INTERVENTIONS

### ★ #1 PRIORITY: AIRWAY

- → **STAY WITH PATIENT!**
- → Calm, safe and quiet environment
- → NPO
- → Rapid intubation kit at bedside
- → Do NOT place supine (harder to breathe)
- → Monitor VS & breathing
- → Prevent things that make child cry

# OTITIS MEDIA

## WHAT IS IT?

Inflammation of the **middle ear**

Can cause eustachian tube to become blocked causing **FLUID BUILD UP IN EAR**

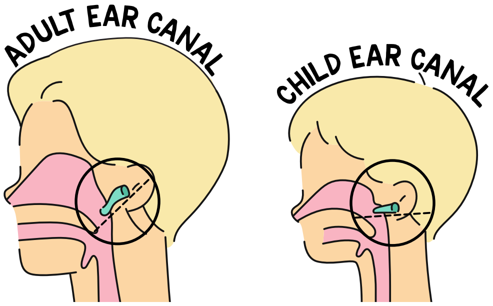
↳ Usually preceded by **upper respiratory infection**

**ACUTE OTITIS MEDIA**

Rapid onset of infection in middle ear

**OTITIS MEDIA WITH EFFUSION**

**Non-infectious** fluid buildup in middle ear



Young children have **shorter**, **wider**, & more **horizontal** eustachian tubes

## RISK FACTORS

- Age (younger= higher risk)
- **Cigarette smoke exposure**
- Bottle feeding
- Allergies
- Family history

## PATHO

Blockage of eustachian tube

↓

Blocks fluid from draining

↓

Bacteria grows in stagnant fluid

↓

**Infection and/or inflammation**

**BLOCKAGE CAUSES:**

| INTERNAL | EXTERNAL |
|---|---|
| URI | Tumor |
| Allergies | Trauma |

## SYMPTOMS

- Pulling on ear (from ear pain)
- Otorrhea (purulent discharge)
- Headache
- Irritability
- URI symptoms
  - Cough
  - Runny nose
  - Congestion
- Fever
- Conductive hearing loss

**COMPLICATIONS**

Perforation & hearing loss

## DIAGNOSTICS

**OTOSCOPY**

**OTITIS MEDIA WITH EFFUSION**

↳ Will show fluid buildup in ear

**ACUTE OTITIS MEDIA**

↳ Will show red & bulging tympanic membrane

↳ Purulent drainage may be present

## TREATMENT

### MEDICATIONS

- Oral antibiotics
  - Amoxicillin or cephalosporin
- Antipyretics

Only given if unresolved after 72 hours

### SUPPORTIVE CARE

- Keep head elevated
- Ibuprofen & acetaminophen for pain

### SURGERY

**For recurrent infections**

- Myringotomy
  - Placement of tubes in ears to drain fluid

# CYSTIC FIBROSIS

## WHAT IS IT?

Genetic disorder that affects the **EXOCRINE GLANDS** of multiple organ systems

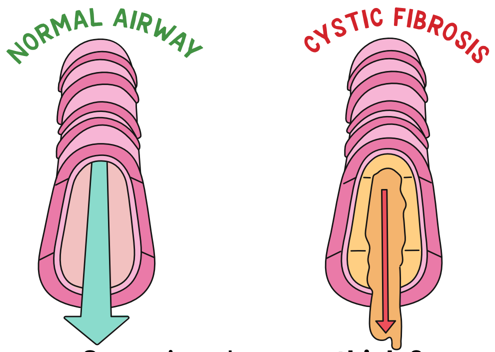
**AUTOSOMAL RECESSIVE DISORDER**

Both mother **AND** father must be carrier of gene

## EXOCRINE GLAND FUNCTION

Produce and release secretions via ducts

**EXAMPLES:**
- Sweat glands
- Salivary glands
- Digestive glands

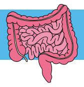


Secretions become **thick & sticky** leading to **NARROWING OF AIRWAY**

## SYMPTOMS

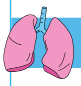
Can affect every system of the body that has secretion ducts

### GI SYMPTOMS



- Meconium ileus **EARLIEST SIGN**
- Abdominal distention
- Loose & fatty stools
- CF-related diabetes
- Constipation & fecal impaction
- Fatty vitamin deficiencies
  - (A ,D, E ,& K)

### RESPIRATORY SYMPTOMS



- Excessive mucous
- Wheezing & rhonchi
- Barrel chest from air trapping
- Finger clubbing from hypoxia
- Chronic respiratory infections

Later stages can lead to **PULMONARY HYPERTENSION**

### OTHER SYMPTOMS

- Salty-tasting skin
  - ↑ sodium in sweat & tears
- Electrolyte imbalances
- Sterility
  - Females: thick cervical mucous
  - Males: Mucous blocks vas deferans

## DIAGNOSTICS

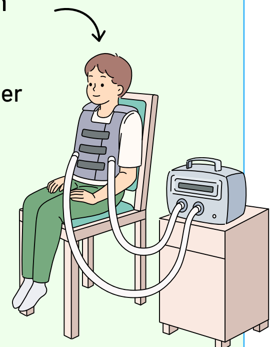
- **SWEAT CHLORIDE TEST:** measures amount of salt in sweat (collected via guaze & sent to lab)
  - < 39 MMOL= negative
  - 40–59 MMOL= further testing required
  - > 60 MMOL= positive for CF
- **GENETIC TESTS:** CFTR gene (controls Na-Cl channels)
- **IMAGING & PULMONARY FUNTION TEST**

## TREATMENT

**NO CURE:** goal is **supportive care**

### RESPIRATORY

- **Bronchodilators:** open airways
- **Mucolytics:** thin mucous
- **Antibiotics:** for respiratory infections
- **Chest PT:** vibrates chest to loosen secretions to cough up
  - Done multiple times a day
  - Done before meals or 1-2 hours after meals to avoid vomiting
- **Postural drainage:** alternating positions to promote drainage
- **Huff coughing**
- **Oxygen supplementation**



### GASTROINTESTINAL

- **Pancreatic enzymes:** take with meals to ↑ absorption
- **Fluids**
- **Stool softeners**
- **Monitor blood glucose**

### DIET

- ↑ protein ↑fat ↑ calorie
- Supplementation of A ,D, E & K
- May require supplemental feeding

# KAWASAKI DISEASE

## WHAT IS IT?

Acute **systemic** inflammation of the arteries

Affects **medium-sized vessels** such as
CORONARY ARTERIES

## PATHO

Immune system activated
↓
Neutrophils attack wall lining of artieries
↓
Inflammation & damage to arteries

Can cause life threatening complications from
CLOTTING, ↓ BLOOD FLOW, & WEAKENING OF ARTERIAL WALLS

- Myocardial infarction
- Aneurysm
- Myocarditis
- Pericarditis

## RISK FACTORS

- Affects children <5 years old
- Mainly male
- Asian or Pacific Islander ancestry

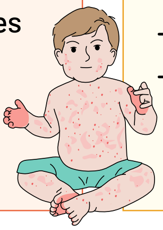
## SYMPTOMS

Symptoms occur in **3 STAGES:**

### ACUTE FEBRILE STAGE

**LASTS 7-14 DAYS**

- HIGH fever (102-104 F) that is **unresponsive to antipyretics**
- Erythema on palms & soles of feet
- Rash on chest/legs/groin
- Red eyes & lips
- Strawberry tongue



### SUBACUTE STAGE

**CONTINUES UNTIL WEEK 4-6**

- Fever resolves
- Peeling of hands & feet
- Joint pain
- Thrombocytosis (PLT VERY high)

**HIGHEST RISK OF ANEURYSM & SUDDEN DEATH**

### CONVALESCENT STAGE

**WITHIN 10 WEEKS OF ONSET**

- Clinical symptoms resolve
- May develop beau lines
  - Deep transverse grooves across nails
- Abnormal labs may be present

## TREATMENT

- IV immunoglobulin
  - Given within first 7 days of onset to avoid heart issues
- High dose aspirin
  - Synergistic effect with IVIG
  - ↓ inflammation ↓ pain ↓ fever
  - Monitored closely by MD
- Anticoagulants for high risk patients

## DIAGNOSTICS

- **LABS**
  - ↑ CRP
  - ↓ albumin
  - ↑ ESR
  - ↑ WBC
- **CLINICAL SYMPTOMS:** must have 4/5 symptoms + fever present for >5 days
  - **C**onjunctivitis
  - **R**ash
  - **E**xtremity changes (erythema & peeling skin)
  - **A**denopathy (swollen lymph nodes)
  - **M**ucosal changes (red, cracked lips & strawberry tongue)

Remember
CREAM

## NURSING INTERVENTIONS

**MONITOR**

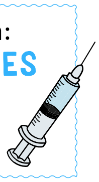
- Vital signs & ECG
- Pain
- I & O
- Daily weights

**SUPPORTIVE CARE**

- Promote rest
- Calm & quiet environment
- Encourage fluids + soft foods
- ROM for joint pain

Parent education:
NO LIVE VACCINES

Must wait at least **11 months**



If treated with IVIG

# REYE'S SYNDROME

## WHAT IS IT?

A rare & life-threatening disease characterized by fatty degenerative **liver failure** and acute noninflammatory **encephalopathy**

**CAUSE NOT COMPLETELY KNOWN**

Commonly associated with recent **VIRAL ILLNESS** (influenza, varicella) + use of **ASPIRIN**

## PATHO

**NOT COMPLETELY KNOWN!**

Salicylate use during viral illness inhibits **hepatocytes**, causing liver dysfunction

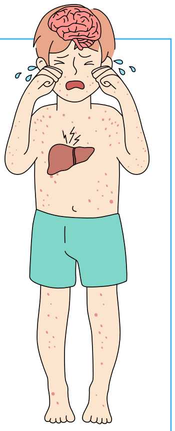
↓

Build up of fatty acids & ammonia

↓

Toxins from ammonia lead to **encephalopathy**

## SYMPTOMS



Mainly affects **LIVER & BRAIN**

**From liver dysfunction:**
- Vomiting & diarrhea

**From cerebral edema:**
- Lethargy
- Confusion
- Irritability
- Seizures

## DIAGNOSTICS

→ **LIVER FUNCTION PANEL**
- ↑ AST
- ↑ ALT
- ↑ Ammonia
- ↑ Coags

→ **LIVER BIOPSY:** will show buildup of fats in liver cells

→ **LUMBAR PUNCTURE:** to rule out meningitis

## TREATMENT

**EARLIER TREATMENT= BETTER OUTCOMES**

- **Osmotic diuretics:** ↓ ICP
    - Mannitol
    - Hypertonic saline
- **Steroids:** ↓ inflammation
- **Vitamin K:** ↑ clotting factors
- **Lactulose:** ↓ ammonia
- Replace electrolytes as needed
- Dialysis for severe cases

## NURSING INTERVENTIONS

- Seizure precautions
- Keep HOB elevated
- Calm & quiet environment
- Emergent intubation kit at bedside
- IV fluids for hydration
- Emotional support

**MONITOR**
- Vital signs & EKG
- Respiratory status
- ICP
- Neuro checks
- Strict I & O
- Labs (liver panel, coags, ammonia)

## EDUCATION

- NO salicylates
    - 🚫 Aspirin (use ibuprofen or acetaminophen instead)
    - 🚫 Alka-seltzer
    - 🚫 Kaopectate
    - 🚫 Pepto-bismol
- Always read medication labels
- Patient may have long-term neuro damage

# SCARLET FEVER

## WHAT IS IT?

Highly contagious bacterial infection caused by **group A streptococcus**

**TRANSMITTED VIA DROPLETS**

## RISK FACTORS

- Children ages 5-15
- Crowded areas (daycare & school settings)
- More common in winter & spring (temperate climates)
- Previous strep throat infection
  - **Not all strep throat infections result in scarlet fever**

## PATHO

Streptococcal infection

↓

Some bacteria adhere to pharyngeal wall causing symptoms

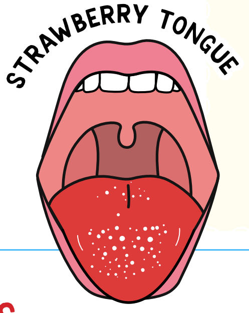
Others produce cytotoxins which cause cytokine release

↓

Inflammatory response & blood vessel dilation that creates hallmark rash

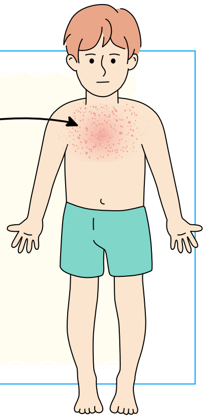
## SYMPTOMS

- Fever
- Headache
- Nausea & vomiting
- Malaise
- Sore throat
- Swollen & red tonsils



### ★ HALLMARK SIGNS

- Strawberry red tongue
- Sandpaper-like rash
  - Diffuse & red
  - Starts on neck & chest, then spreads outwards to extremities
  - Does NOT appear on hands or feet



## COMPLICATIONS

- Rheumatic fever
- Glomerulonephritis
- Pneumonia
- Sepsis

## DIAGNOSTICS

**RAPID STREP TEST:** assess for strep bacteria

**THROAT CULTURE:** results take longer but may find bacteria that rapid test misses

## TREATMENT

### MEDICATIONS

- Antibiotics
  - Penicillin & amoxicillin
  - Cephalosporin/macrolides if allergic to penicillin

Must take full course of antibiotics to prevent development of complications

- Antipyretics for fever

## NURSING INTERVENTIONS

- Monitor temperature
- Cool mist humidifier
- Saltwater gargle
- Calm & comfortable environment
- Promote adequate rest

### DIET

- Avoid irritants
- Soft foods
- Increase fluid intake
- Cold foods (popsicles)

# SIDS (SUDDEN INFANT DEATH SYNDROME)

## WHAT IS IT?

Sudden death of an infant < 1 year old that is **unexpected, unexplained, and without obvious cause**

Cause of death cannot be explained even with thorough examination & autopsy

**LEADING CAUSE OF DEATH IN INFANTS**

**NO SIGNS OR SYMPTOMS**

## RISK FACTORS

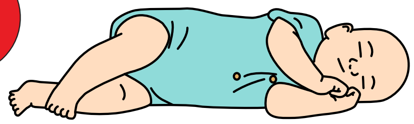
- Age 1-6 months ↑ risk
- More common in males
- Premature & low birth weight
- Co-sleeping with parent
- Infection
- Baby sleeping on stomach or side
- Bedding items (can smother)
- Exposure to smoking
- Low socioeconomic status
- Family history

## PREVENTION

- Always place baby supine while sleeping
- Bedding
  - Avoid co-sleeping (must have a crib)
  - Only use firm mattress
  - No unnecessary blankets, toys, or pillows
- Don't overdress baby
- Don't smoke
- Normal room temperature
- Use of pacifier
- Encourage breastfeeding

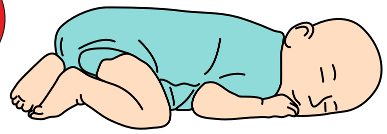
## DO NOT PLACE BABY:

### LAYING ON SIDE



Can create torsion or twist of trachea, causing baby to choke

### LAYING ON BELLY

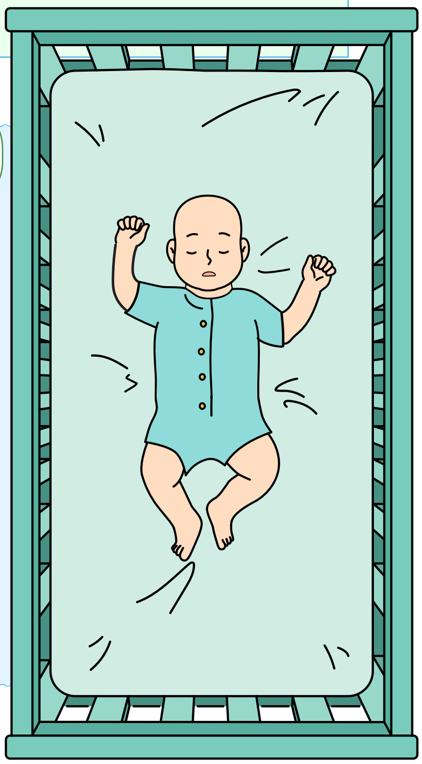


Can lead to airway obstruction or CO2 buildup due to rebreathing exhaled breath

## SAFE SLEEPING

- ✓ Alone
- ✓ Supine
- ✓ Firm mattress
- ✓ No extra items
- ✓ Light clothing
- ✓ In crib

Keep crib in room in same area where you sleep but **never share bed with infant**



# FEBRILE SEIZURES

## WHAT IS IT?

Seizures that occur in children that are **triggered by fever**

## RISK FACTORS

- Age 6 months- 5 years old
- Rapidly developed fever
- **HIGH** fever
- Family history

## SIMPLE FEBRILE SEIZURE

- One seizure within 24 hour period
- Affects entire body
- Lasts <15 minutes

## COMPLEX FEBRILE SEIZURE

- More than one seizure within 24 hour period
- Affects one side of body
- Lasts LONGER than 15 minutes

## TREATMENT

- NO anticonvulsants (unless severe)
- Rectal diazepam
- Antipyretics

## FEVER MANAGEMENT

- Encourage fluids
  - Pedialyte 2-5 mL q 5 mins
- Cold compresses on forehead
- Tepid sponge bath
- Remove excess clothing

ELECTROLYTES

## PATHOLOGY UNKNOWN

**POSSIBLE THEORIES:**

① ↑ core temp= ↑ neuron excitability
② Fever produces cytokines= neuro dysfunction
③ Fever causes hyperventilation= respiratory alkalosis

## SYMPTOMS

**FEVER >100.4F OR 38C**

**SEIZURE CHARACTERISTICS:**

Usually generalized **clonic seizure** or **tonic-clonic seizure**

**CLONIC SEIZURES**

Repeated jerking movements

**TONIC-CLONIC SEIZURES**

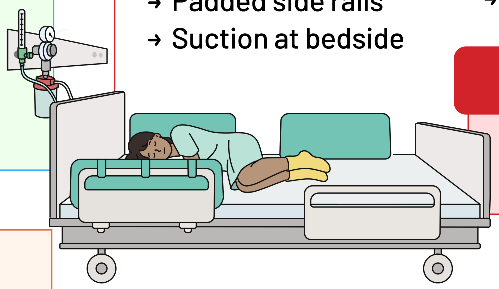
Stiffening & jerking movements

## POSTICTAL PERIOD

- Drowsiness
- Confusion
- Loss of conciousness

## SEIZURE PRECAUTIONS

- Side lying position
- Side rails up
- Padded side rails
- Suction at bedside
- Bed low position
- Curtain for privacy
- Pillow under head



**SEEK MEDICAL ATTENTION IF:**

- Seizure lasts >5 min
- Repeated seizures

# CEREBRAL PALSY

## WHAT IS IT?

Disorder of movement, coordination, or posture caused by damage to developing brain before childbirth

## RISK FACTORS

- Infections during pregnancy
  - Rubella
  - Varicella
  - Cytomegalovirus
- Nutritional deficiencies
- Premature birth
- Kernicterus
  - From severe, untreated jaundice
  - Can occur from Rh incompatibility
- Birth complications causing fetal hypoxia
  - Placenta abruptio
  - Placenta previa

## SYMPTOMS

- Developmental delays
  - Problem or failure to crawl
  - Growth delays
- Hand preference before age 1 ← SIGN OF HEMIPLEGIA
- Abnormal muscle tone
- Increased or decreased reflexes

## TYPES of CEREBRAL PALSY

### SPASTIC

MOST COMMON TYPE

**Motor cortex** damage

- May involve one or both sides of body
- Stiff & jerking movements
- Limbs usually underdeveloped
- Muscle stiffness & tightness

### DYSKINETIC/ ATHEOID

**Basal ganglia** damage

- "Worm-like" movements
  - Slow, writhing muscle contractions
- Drooling
- Involuntary jerking movements
- Disappear during sleep & ↑ with stress

### ATAXIC

LEAST COMMON TYPE

**Cerebellum** damage

- Balance & coordination issues
- Shaky movements
- Wide-based gait
- Issues with depth perception

CAN HAVE MIXED WHERE MULTIPLE TYPES PRESENT

Most common mixed types are SPASTIC/ATHETOID & SPASTIC/ATAXIC

## TREATMENT

NO CURE

EARLY INTERVENTION= ↑ QUALITY OF LIFE

### MEDICATIONS

- **Botulin A (Botox):** ↓ muscle spasticity
- **Anticonvulsants**
- **Anticholinergics:** ↓ tremors
- **Muscle relaxers:** Baclofen

- ROM exercises
- Orthotic braces
- Allow frequent rest periods
- Encourage self-care
- Emotional support

# PHENYLKETONURIA (PKU)

## WHAT IS IT?

Rare genetic disorder of the inability to breakdown PHENYLALANINE into TYROSINE that can lead to **brain & nerve damage** if untreated

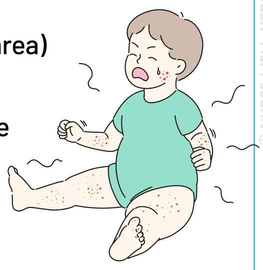
## CAUSES/ RISK FACTORS

**AUTOSOMAL RECESSIVE GENETIC DISORDER**

Must inherit one gene from **BOTH** parents

- → Family history
- → Ancestors that come from same region

## SYMPTOMS



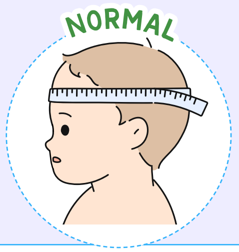
- → **Fair hair and skin**
  - Tyrosine creates melanin
- → Eczema (particularly perineal area)
- → Musty body odor
  - Phenylketones in sweat & urine
- → Neurological dysfunction
  - Failure to thrive
  - Seizures
  - Extreme hyperactivity
  - Progressive retardation or intellectual disability
  - Behavioral & emotional issues (↓ dopamine & serotonin)

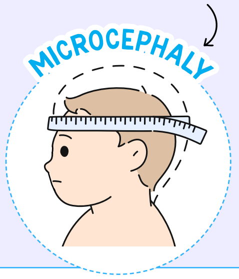
## PREGNANT MOTHERS WITH PKU

**MUST FOLLOW PKU DIET DURING PREGNANCY**

If not managed properly can cause:

- Miscarriage
- Cognitive disabilities
- Heart defects
- Microcephaly





**PHENYLALANINE** is an essential amino acid in the body that converts into **TYROSINE** through **phenylalanine hydroxylase**

↓

**TYROSINE** coverts into other products like:

- Dopamine
- Serotonin
- Norepinephrine
- Epinephrine

In **PKU** there is ↓ phenylalanine hydroxylase = impaired ability to use phenylalanine which leads to

**BUILDUP OF PHENYLALANINE IN TISSUES + BLOOD**

## DIAGNOSTICS

**TESTING REQUIRED IN MOST STATES**

- → **GUTHRIE INHIBITION ASSAY**
  - Done when baby 24 hours old & after baby has ingested protein
- → **PLASMA PHENYLALANINE**
  - >4 MG/DL= PKU
- → **PRE-PREGNANCY SCREENING**

## TREATMENT

- → Regular blood tests (more frequent when younger)
- → Sapropterin: ↓ phenylalanine

### DIET

- → Phenylalanine-free formula (protein without phenylalanine)
- → **Limit protein intake** (protein contains phenylalanine)
- → Amino acid supplementation

**FOODS TO MONITOR:**

- Meat
- Fish
- Dairy
- Legumes

**AVOID ASPARTAME!** (artificial sugar)
Diet soda, sugar-free gum & foods, "lite" yogurt

# MUSCULAR DYSTROPHY
## DUCHENNE & BECKER

### WHAT IS IT?

Genetic disorder that **progressively damages and weakens muscles overtime**

Caused by mutation in **DYSTROPHIN GENE**

There are multiple types of **MUSCULAR DYSTROPHY:**

- Duchenne
- Becker
- Mytonic
- Facioscapulohumeral
- Congenital
- Limb-girdle

Most common is **DUCHENNE** & **BECKER**

### RISK FACTORS

Both are **X-LINKED RECESSIVE GENETIC DISORDERS**

- → Almost exclusively in males
- → Females can be asymptomatic carriers

### DIAGNOSTICS

- → ↑ **CREATININE KINASE**
- → **GENETIC TESTING**
- → **MUSCLE BIOPSY**

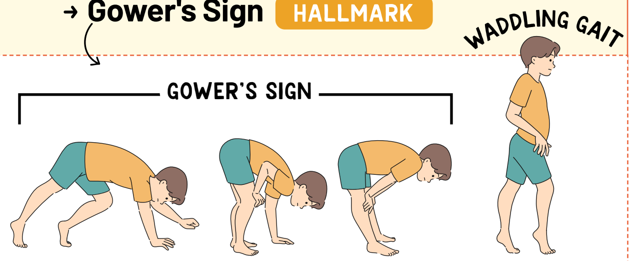
### DUCHENNE

**MORE SEVERE**

Dystrophin is **completely absent**

**ONSET:** < 5 years old
**LIFE EXPECTANCY:** 15-20 years

- → "Waddling" gait
- → Frequent falls
- → Pseudohypertrophy in calves
  - due to ↑ fat deposits & fibrotic tissue
- → Cognitive delays
- → **Gower's Sign** **HALLMARK**



### BECKER

**Some** dystrophin present, but doesn't **function properly**

**ONSET:** 10-20 years old
**LIFE EXPECTANCY:** 40-50 years

Same symptoms as Duchenne but ***milder***

- → Weakness starts in **hips & pelvis first**
- → Slower progression
- → NO respiratory symptoms initially
- → Usually ambulatory until 20's

### COMPLICATIONS (FOR BOTH)

- Respiratory failure from weak diaphragm
- Cardiomyopathy
- Loss of motor function/ paralysis
- Scoliosis

### TREATMENT/ NURSING INTERVENTIONS

**NO CURE**

**GOAL:** maintain ambulation as long as possible & maintain quality of life

- → **Corticosteroids:** delay cellular damage
- → Emotional support
- → PT & OT
- → ↑ fluids & fiber to avoid constipation
- → Encourage ambulation as long as possible
  - Assistive devices
  - Active & passive daily ROM
  - Splints & braces to avoid contractures
- → Healthy diet to avoid weight gain (makes ambulation more difficult)

PEDIATRICS

# DEVELOPMENTAL HIP DYSPLASIA

## WHAT IS IT?

Developmental disorder where the **femoral head and acetabulum** (ball & socket joint of the hip) are improperly formed

CAN AFFECT ONE OF BOTH HIPS

## RISK FACTORS

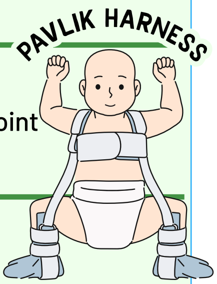
- More common in females
- Family history
- Mechanical force applied to fetal thigh
  - Born in breech position
  - Macrosomic newborn
  - Oligohydramnios
  - Swaddling tightly with legs extended

## SYMPTOMS

- Shortened leg on affected side
- Asymmetrical gluteal & thigh folds
- Asymmetrical mobility
- Abnormal gait (older children)

## TREATMENT

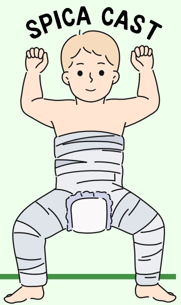
### < 6 MONTHS OLD:



- Pavlik harness
  - Keeps leg in flexion to stabilize hip joint

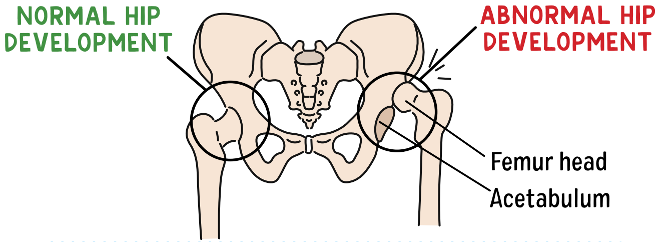
### 6 MONTHS– 2 YEARS OLD:

- Closed reduction
  - Surgery requiring anesthesia to manually place femur head in acetabulum (without cutting)
- Spica cast after surgery
  - Immobilizes hips & spine
- After Spica cast: brace until fully healed



### >2 YEARS OLD:

If no improvement with surgery or harness, will require **open reduction** (invasive surgery)



**DYSPLASIA**

- Head of femur in **shallow** acetabulum
- **Dislocates** on physical exam

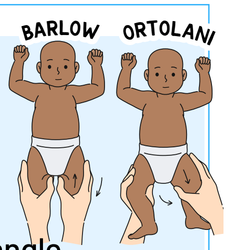
**SUBLUXATION**

- Head of femur loose in acetabulum
- **Does NOT** dislocate on physical exam

**DISLOCATION**

No contact between femur head & acetabulum

## DIAGNOSTICS



### < 6 MONTHS OLD:

- X-ray or ultrasound
- **Barlow Maneuver:** Adduct hip while holding knee straight
- **Ortolani Maneuver:** Abduct hip while knee flexed in 90 degree angle

If "clunks" are felt or heard= **POSITIVE SIGN**

### > 6 MONTHS OLD:

- **Hip abduction test:** Gradually abduct thighs with hips flexed at 90 degrees
- **Trendelenburg test:** Stand on one foot for 30 seconds without leaning

If pelvis on same side as lifted leg drops= **POSITIVE SIGN**

## NURSING INTERVENTIONS

### PAVLIK HARNESS

- Harness must be worn **at all times**
- Wear layer of clothing under harness to prevent skin irritation
- Change diaper while baby in harness
- Monitor for skin breakdown multiple times per day

### SPICA CAST

- Keep cast clean & dry
- Monitor skin creases for breakdown
- Reposition every 2 hours at least

# CONGENITAL HEART DEFECTS
## DECREASED PULMONARY BLOOD FLOW

Both are congenital heart defects that cause decreased pulmonary blood flow from **right to left side of heart**

**↓ BLOOD TO LUNGS= HYPOXIA= BLUE BABIES**

### NORMAL BLOOD FLOW

Deoxygenated blood flows from **right to left** into the lungs to become oxygenated, then through the aorta to the rest of the body

### TETROLOGY OF FALLOT & TRICUSPID ATRESIA

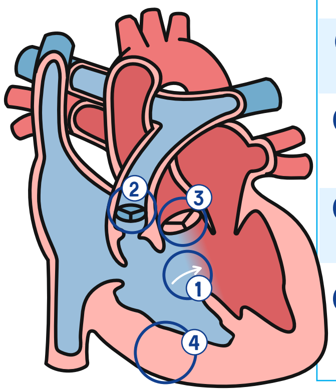
Both cause **right-to-left shunts**, causing blood to **NOT** become oxygenated before going to rest of body

Causes defects to be created to compensate for ↓ pulmonary blood flow such as **ASD & VSD**

## TETROLOGY OF FALLOT

MOST COMMON

TET= FOUR



### WHAT IS IT?

**FOUR** defects together:

① **VENTRICULAR SEPTAL DEFECT**
Hole between ventricles

② **PULMONARY STENOSIS**
Narrowing of pulmonary valve

③ **OVERRIDING AORTA**
Aorta on top of VSD

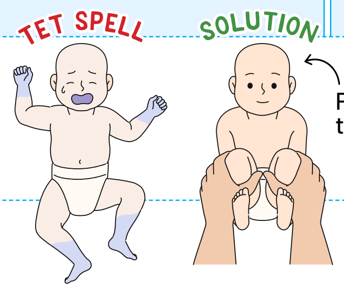
④ **RIGHT VENTRICULAR HYPERTROPHY**
Thickening of right ventricle wall

### SYMPTOMS

- "Tet spells"
  - Turn blue when crying or feeding
- Poor weight gain
- Systolic heart murmur

### TREATMENT

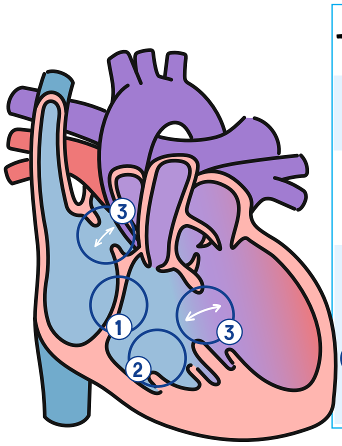
- Surgical repair within first year of life
  - Shunt placement
  - Stent placement
- May need immediate temporary surgery after birth if severe + prostaglandin drip



Place in **knee-chest position** to ↑ blood flow to lungs

## TRICUSPID ATRESIA

TRI= THREE



### WHAT IS IT?

**THREE** defects together:

① **NO TRICUSPID VALVE**
Blocked between R atrium & ventricle

② **HYPOPLASTIC RIGHT VENTRICLE**
Right ventricle is underdeveloped

③ **ATRIAL SEPTAL DEFECT**
Hole between R & L atrium

OR

③ **VENTRICULAR SEPTAL DEFECT**
Hole between R & L ventricle

Other defects occur due to
**MISSING TRICUSPID VALVE**

### SYMPTOMS

- Cyanosis
- Tachycardia
- Dyspnea
- Lethargy
- Finger clubbing

### TREATMENT

- For extreme case of cyanosis may require prostaglandin drip immediately after birth
- **Multiple surgeries required**

### SURGERY STAGES

| | |
|---|---|
| **STAGE 1**<br>2 Weeks Old | Shunt placement from aorta to pulmonary artery |
| **STAGE 2**<br>2-4 Months Old | Glenn procedure (connect pulmonary artery to SVC) |
| **STAGE 3**<br>2-5 Years Old | Fontan procedure (connect pulmonary artery to IVC) |

# CONGENITAL HEART DEFECTS
## INCREASED PULMONARY BLOOD FLOW

Group of congenital defects that cause increased pulmonary blood flow from **left to right side of heart**

**NO HYPOXIA PRESENT**

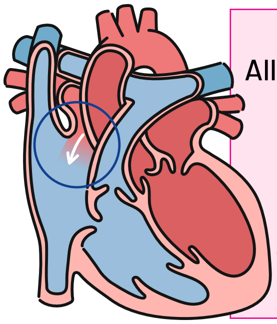
### BACKFLOW OF BLOOD!

Already oxygenated blood flows **BACK** into circulation & is oxygenated **AGAIN**

Causes ↑ **BLOOD VOLUME** which leads to ↑ workload on the heart

## ATRIAL SEPTAL DEFECT

Hole between right & left **atria**



### PATHO

Allows blood to flow from left atrium to right atrium

↓

Too much blood to right side of heart

↓

Too much blood to lungs

### SYMPTOMS

Often **asymptomatic** until later in life

- **Midsystolic** murmur
- Frequent respiratory infections
- Tachypnea
- Infant tires with feeding
- Poor growth rate

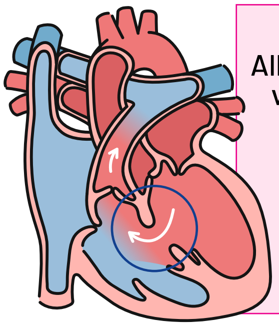
### TREATMENT

- Surgery
  - Cardiac cath to place patch over opening
- Heart Failure Medications
  - Diuretics
  - Digoxin
  - Beta Blockers

**SAME SYMPTOMS & TREATMENT!**

## VENTRICULAR SEPTAL DEFECT

Hole between right & left **ventricles**



### PATHO

Allows blood to flow from left ventricle to right ventricle

↓

Too much blood to right side of heart

↓

Too much blood to lungs

### SYMPTOMS

Often **asymptomatic** until later in life

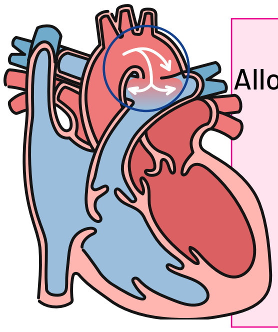
- **Pansystolic** murmur
- Frequent respiratory infections
- Tachypnea
- Infant tires with feeding
- Poor growth rate

### TREATMENT

- Surgery
  - Cardiac cath to place patch over opening
- Heart failure medications
  - Diuretics
  - Digoxin
  - Beta blockers

## PATENT DUCTUS ARTERIOSIS

Opening between **pulmonary artery** and **aorta**



### PATHO

Allows blood to flow from aorta into pulmonary artery

↓

Blood from pulmonary artery flows into lungs

↓

Too much blood to lungs

### SYMPTOMS

Often **asymptomatic** until later in life

- Continuous murmur
- Tachypnea
- Wide pulse pressure
- Bounding pulse
- Activity intolerance

### TREATMENT

Small PDA will close on it's own

- Indomethacin
  - Prostaglandin inhibitor
  - Helps close hole
  - Used in premature infants
- Surgery
  - Cardiac cath to close hole

# CONGENITAL HEART DEFECTS

## OBSTRUCTION OF BLOOD FLOW

Group of congenital defects that cause blood leaving heart to be **obstructed due to stenosis**

**AREA BEFORE STENOSIS**
has **increased** pressure

**AREA AFTER STENOSIS**
has **decreased** pressure

**CAUSES ↓ CARDIAC OUTPUT**

## AORTIC STENOSIS

Narrowing of **aortic valve**

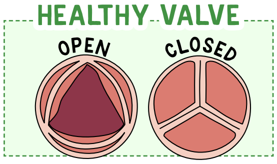
**AORTIC VALVE FUNCTION**

Valve connecting **left ventricle** and **aorta**

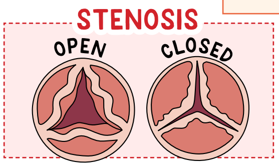
Reduces blood flow to **BODY**

**LIFE THREATENING**

**HEALTHY VALVE**



**STENOSIS**



### SYMPTOMS

- → Hypotension
- → Tachycardia
- → Weak pulses
- → Activity intolerance
- → Difficulty feeding
- → Dizziness

### TREATMENT

- → Surgery
  - ▸ Balloon dilation
  - ▸ Valvotomy (opens narrowed valve)
  - ▸ Valve replacement

## PULMONARY STENOSIS

Narrowing of **pulmonary valve**

**PULMONARY VALVE FUNCTION**

Valve connecting **right ventricle** and **pulmonary artery**

Reduces blood flow to **LUNGS**

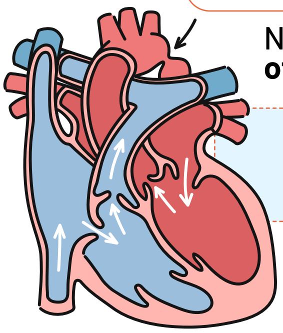
### SYMPTOMS

- → **Systolic ejection murmur**
- → Cyanosis
- → Tachycardia
- → Cardiomegaly
- → Heart failure

### TREATMENT

- → Surgery
  - ▸ Balloon dilation
  - ▸ Valvotomy (opens narrowed valve)
  - ▸ Valve replacement

## COARCTION OF AORTA



Narrowing of **main body of aorta**

**AORTA FUNCTION**

Supplies blood **to body**

Narrowing occurs **after** blood supplied to upper body

Reduces blood flow to
**LOWER PORTION OF BODY**

### SYMPTOMS

**Upper extremities**

- → Bounding pulses
- → Hypertension

**Lower extremities**

- → Poor perfusion
- → Cool & pale skin

### TREATMENT

- → Antihypertensives
- → Surgery
  - ▸ Balloon angioplasty with stent placement
  - ▸ Resection of narrowed part of aorta

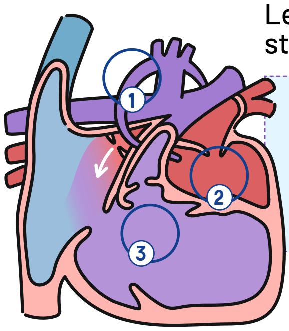
# CONGENITAL HEART DEFECTS

## MIXED BLOOD FLOW

Group of congenital defects that cause
**oxygenated and deoxygenated blood to mix**

Under or abnormally developed heart anatomy leads to dysfunction and
**POOR BLOOD OXYGENATION & CIRCULATION**

## HYPOPLASTIC LEFT HEART SYNDROME



Left side of heart and structures are **underdeveloped**

- ① Underdeveloped aorta
- ② Small left ventricle
- ③ Right ventricle acting as pump for lungs & body

**PDA & ASD** will also be present

**LIFE THREATENING**

### SYMPTOMS

- Weak pulses
- Dyspnea
- Difficulty feeding
- Cyanosis
- Cold extremities
- Lethargy

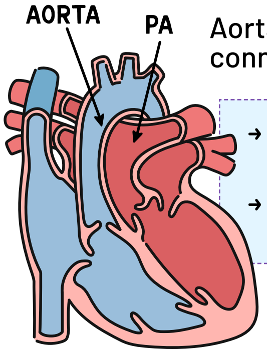
### TREATMENT

- Prostaglandin to keep PDA open until surgery
- **Multiple surgeries required**

### SURGERY STAGES

| | |
|---|---|
| **STAGE 1**<br>2 Weeks Old | Norwood procedure (new aorta built & redirect R vent. bloodflow) |
| **STAGE 2**<br>4 Months Old | Glenn shunt procedure (connect pulmonary artery to SVC) |
| **STAGE 3**<br>2-Years Old | Fontan procedure (connect pulmonary artery to IVC) |

## TRANSPOSITION OF GREAT ARTERIES



Aorta and pulmonary artery connections to the heart are **REVERSED**

- Right & left side of the heart not communicating
- DEoxygenated blood is being pumped to rest of body

**LIFE THREATENING**

### SYMPTOMS

- Severe cyanosis
- Shortness of breath
- Cardiomegaly
- Hypoxia
- Fatigue
- Poor feeding

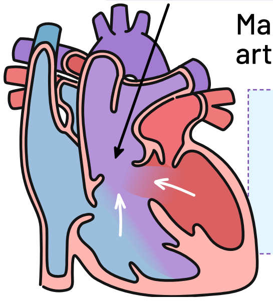
### TREATMENT

- Prostaglandin to keep PDA open until surgery
- **Surgery within 1st week of life to reverse connections**

If VSD, ASD or PDA also present at birth= **SHORT TERM BENEFIT**

Allows for **partial** oxygenation of blood

## TRUNCUS ARTERIOSIS



Main vessel fails to separate into two causing **ONE** artery that connects to right and left ventricles

- Pulmonary artery & aorta are replaced by ONE artery
- Ventricular septal defect will also be present

Causes ↑ blood to lungs &
**POORLY OXYGENATED BLOOD TO BODY**

### SYMPTOMS

- Cyanosis
- Ejection systolic murmur
- Heart failure
- Pulmonary hypertension
- Poor feeding
- Low growth rate

### TREATMENT

- **Surgery within first few weeks of life**
- Medications to manage heart failure until surgery
  - Digoxin
  - Diuretics
  - ACE inhibitors

# CLEFT LIP & CLEFT PALATE

## WHAT IS IT?

Congenital defect causing openings or slits in upper lip, roof of mouth, or both

Can have variations of both **CLEFT LIP** & **CLEFT PALATE** together

## RISK FACTORS

- → Genetics (can inherit part of gene from either parent)
- → Intrapartum infections
- → Tobacco/ alcohol/ drug use while pregnant
- → Vitamin deficiencies (folic acid)

## SYMPTOMS

- → Visible split in the lip or palate
- → Difficulty feeding
- → Difficulty swallowing
- → Nasal speaking voice

## TREATMENT

### SURGERY

- → Recommended to be done within first 18 months of life
- → Will need dental speech appliance if surgery delayed past 3 years old

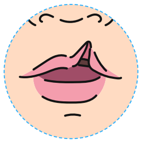
## EDUCATION

- ▸ If baby making loud noises (clicking & sounds) may not have a good latch
- ▸ Stimulate sucking by rubbing nipple against infant's lower lip
- ▸ Always feed in upright position

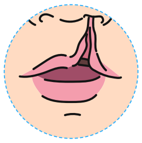
Facial structures don't form properly while in utero

**IF NOT TREATED CAN HAVE IMPACT ON:**

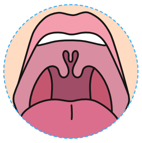
- ▸ Feeding
- ▸ Teeth development
- ▸ Speaking
- ▸ Emotional wellbeing



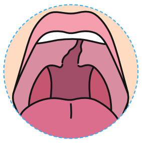
**PARTIAL CLEFT LIP**
Partial fissure of the upper lip



**COMPLETE CLEFT LIP**
Complete separation of lip & nasal sill



**PARTIAL CLEFT PALATE**
Separation in soft palate only

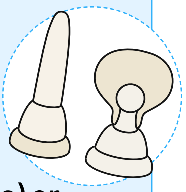


**COMPLETE CLEFT PALATE**
Separation in soft & hard palate

## NURSING INTERVENTIONS

- → Provide emotional support to parents
- → Educate about cleft repairs
- → **Feeding education**

↓



**FEEDING**

- → Lamb's nipples (extra long nipples) or wide nipples to help create seal
- → **For unilateral cleft lip:** feed on the *unaffected side*
- → Allow adequate swallow time during feedings
- → Feed infant slowly and burp frequently

# HYPERTROPHIC PYLORIC STENOSIS

## WHAT IS IT?

Thickening and narrowing of the **pyloric sphincter** (connection between duodenum & small intestine)

Blocks food from reaching **SMALL INTESTINE**

## RISK FACTORS

- Early antibiotic use
- Family history
- Age (2-8 weeks old)
- More common in males
- Premature newborns

## SYMPTOMS

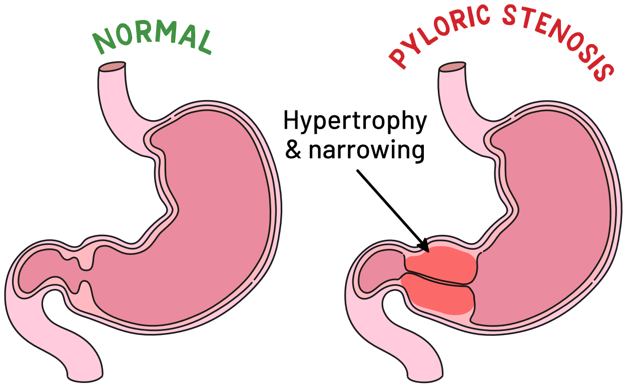
- **Projectile vomiting** (occurs after eating)
- Palpable RUQ olive-shaped mass
- Visible peristalsis
- Increased appetite despite regular feedings
- Weight loss
- Dehydration

## COMPLICATIONS

**METABOLIC ALKALOSIS**
Frequent vomiting depletes acid in stomach

**HYPOKALEMIA**
Frequent vomiting leads to excess loss of potassium which can cause arrhythmias

**MALNUTRITION**
Inadequate absorption & frequent vomiting leads to dehydration & inadequate nutrition which can lead to failure to thrive



## DIAGNOSTICS

- **ULTRASOUND:** view thickness of pyloric muscle
- **LABS:** assess for dehydration, electrolyte imbalances & metabolic alkalosis
  - ↑ HCT (hemoconcentration)
  - ↑ BUN
  - ↓ K
  - ↑ blood pH
  - ↑ HCO3

## TREATMENT

### PYLOROTOMY

Minimally invasive procedure that cuts outer muscle of pylorus to relieve obstruction

## NURSING INTERVENTIONS

- IV fluids
- NGT if vomiting to decompress stomach
- Comfort & emotional support
- Monitor:
  - Electrolytes
  - Vital signs & EKG
  - Daily weights
  - Episodes of vomiting + stools

### POST-OP

- ★ Small, frequent feeds started within 24 hours of procedure
- ★ Feedings gradually increased to normal feedings within 2 days post-op
- ★ Feed infant slowly while in upright position

# INTUSSUSCEPTION

## WHAT IS IT?

A segment of the colon **telescopes into another portion**, causing bowel obstruction

Most commonly occurs in
**JUNCTION OF ILEUM & CECUM**

## RISK FACTORS

**CAUSE UNKNOWN**

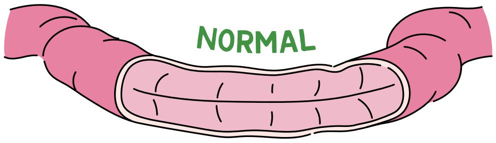
- Age 3 months-24 months
- Meckel's diverticulum
- Celiac disease
- Cystic fibrosis
- Recent viral infection

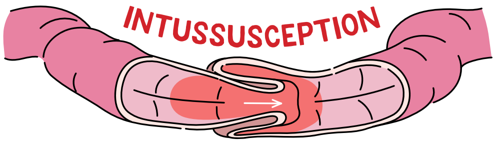
## SYMPTOMS

- **Red currant jelly stool**
- Abdominal pain
  - Severe, colicky, intermittent
  - Child will draw up legs towards abdomen during episode
- Vomiting and diarrhea
- Sausage-shaped mass in upper abdomen

## TREATMENT

- **Barium or air enema:** Pressure can help unfold intestine
- Antibiotics for infection
- Surgical reduction
  - Resect or manually reduce area
  - Only done if other methods are ineffective





## PATHO

Intestines telescope into themselves
↓
Bowel obstruction & ↓ blood flow
↓
↑ edema + pressure
↓
**BOWEL ISCHEMIA**

## DIAGNOSTICS

★ **AIR OR BARIUM ENEMA:** diagnostic procedure & treatment for reducing intussusception

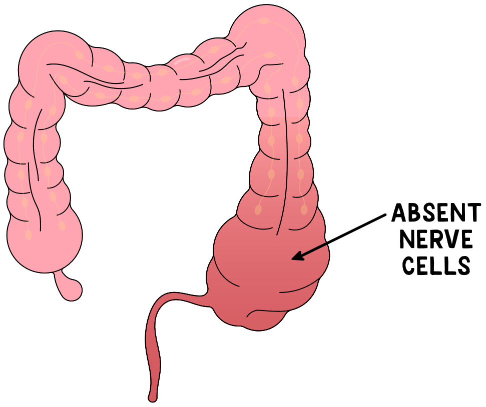
- **ULTRASOUND:** will see "bullseye sign" (from intestine coiling within intestine)

## NURSING INTERVENTIONS

- IV fluids
- NG tube insertion for gastric decompression
- Keep patient NPO
- Monitor:
  - Vital signs
  - I & O
  - Pain
  - Stool consistency and color
  - Signs of perforation or shock

# HIRSCHSPRUNG DISEASE

## AKA CONGENITAL AGANGLIONIC MEGACOLON



### WHAT IS IT?

Congenital disorder causing **lack or absence of GANGLION CELLS in colon** which leads to decreased bowel motility

**MAINLY AFFECTS SIGMOID COLON**

### RISK FACTORS

- Family history
- More common in males
- Genetic associated conditions
  - Down syndrome
  - Waardenburg syndrome

**GANGLION CELLS** are nerve cells normally located throughout the colon that the sympathetic nervous system stimulates for peristalsis to occur

↓

In **HIRSCHSPRUNG DISEASE**, these cells are lacking or completely missing, not allowing peristalsis to occur, leading to **PERSISTENT CONSTIPATION**

### SYMPTOMS

#### NEWBORNS & INFANTS

- Failure to pass meconium within 2 days of birth
- Constipation
- "Squirt" sign
  - Digital rectal exam leads to explosive passage of gas & watery stool
- Abdominal distention
- Trouble feeding

#### YOUNG CHILDREN

- Ribbon-like stools
- Chronic constipation
- Malnourishment
- Abdominal distention & pain

### DIAGNOSTICS

★ **RECTAL BIOPSY:** will show absence of ganglion cells

- **ABDOMINAL X-RAY:** assess for obstruction

### TREATMENT

- IV fluids & electrolytes
- Stool softeners
- Enemas for constipation
- Antibiotics for infection

#### SURGERY

- Temporary colostomy to rest bowel
- Definitive surgery to remove aganglionic portion of bowel

### COMPLICATION: ENTEROCOLITIS

Inflammation & obstruction of the intestine

- Abdominal distention
- Fever
- Bloody diarrhea
- Signs of sepsis

Can lead to **TOXIC MEGACOLON** & **BOWEL PERFORATION**!

**TREATMENT:**

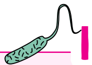
- Antibiotics
- Fluid resuscitation
- Stomach decompression

### NURSING INTERVENTIONS

- NGT placement (low intermittent suction)
- Strict I &O
- Provide emotional support
- Monitor fluid & electrolytes
- Monitor bowel sounds

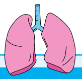
# PHARMACOLOGY

# PREFIXES & SUFFIXES



## IMMUNE MEDS

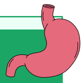
| DRUG TYPE | PREFIX/ SUFFIX | EXAMPLE |
|---|---|---|
| Tetracyclines | -CYCLINE | Doxy**cycline** |
| Aminoglycosides + Macrolides | -MYCIN | Genta**mycin**, Clinda**mycin** |
| Cephalosporins | CEF- or CEPH- | **Cef**azolin, **Ceph**alexin |
| Penicillins | -CILLIN | Amoxi**cillin** |
| Fluoroquinolones | -FLOXACIN | Cipro**floxacin** |
| Sulfonamides | SULF- | **Sulf**asalazine |
| Antifungals | -AZOLE | Flucon**azole** |
| Antiviral/ Antiflu | -VIR | Oseltami**vir** |
| Antiviral/ Antiherpes | -CLOVIR | Acy**clovir** |
| Monoclonal Antibodies | -MAB | Rituxi**mab** |
| NRTIs (HIV drug) | -VUDINE | Zido**vudine** |
| Protease Inhibitors (HIV drug) | -NAVIR | Indi**navir** |



## RESPIRATORY MEDS

| DRUG TYPE | PREFIX/ SUFFIX | EXAMPLE |
|---|---|---|
| Beta-2 Agonists | -TEROL | Albu**terol** |
| Xathine Derivatives | -PHYLLINE | Amino**phylline** |
| Anticholinergics | -TROPIUM | Ipra**tropium** |
| Leukotriene Modifiers | -LUKAST | Monte**lukast** |

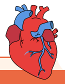
## GASTROINTESTINAL MEDS



| DRUG TYPE | PREFIX/ SUFFIX | EXAMPLE |
|---|---|---|
| H2 Blockers | -TIDINE | Famo**tidine** |
| Proton Pump Inhibitors | -PRAZOLE | Panto**prazole** |
| Antiemetics | -SETRON, -AZINE | Ondan**setron**, Prometh**azine** |

## PAIN & ANESTHESIA MEDS

| DRUG TYPE | PREFIX/ SUFFIX | EXAMPLE |
|---|---|---|
| NSAIDs | -PROFEN | Ibu**profen** |
| Opioids | -DONE & -ONE | Oxyco**done**, Hydromorph**one** |
| Local Anesthetics | -CAINE | Lido**caine** |
| Inhaled Anesthetics | -ANE | Haloth**ane** |
| Neuromuscular Blockers | -URONIUM, -CURIUM | Vec**uronium**, Cisatra**curium** |



## CARDIAC MEDS

| DRUG TYPE | PREFIX/ SUFFIX | EXAMPLE |
|---|---|---|
| ACE Inhibitors | -PRIL | Lisino**pril** |
| Calcium Channel Blockers | -DIPINE OR -AMIL | Amlo**dipine**, Verap**amil** |
| Angiotensin II Receptor Blocker | -SARTAN | Lo**sartan** |
| Beta Blockers | -OLOL | Metopr**olol** |
| HMG-CoA Reductase Inhibitor | -STATIN | Simva**statin** |
| Alpha-1 Blockers | -OSIN | Praz**osin** |
| Thiazide Diuretics | -THIAZIDE | Hydrochloro**thiazide** |
| Loop Diuretics | -SEMIDE OR -IDE | Furo**semide**, Bumetan**ide** |
| Potassium-Sparing Diuretics | -ACTONE | Spironol**actone** |
| Cardiac Glycosides | -OXIN | Dig**oxin** |
| Factor Xa Inhibitors | -XABAN | Api**xaban** |
| Antithrombotics | -PARIN | He**parin**, Enoxa**parin** |

## NEURO/ PSYCH MEDS

| DRUG TYPE | PREFIX/ SUFFIX | EXAMPLE |
|---|---|---|
| Antypical Antidepressants | -ZODONE | Tra**zodone** |
| Tricyclic Antidepressants | -PRAMINE, -TRIPTYLINE | Clomi**pramine**, Ami**triptyline** |
| Atypical Antipsychotics | -RIDONE | Risper**idone** |
| Benzodiazepines | -PAM & -LAM | Clonaze**pam**, Alprazo**lam** |
| Selective Serotonin Reuptake Inhibitors | -XETINE, -PRAM | Flu**oxetine**, Citalo**pram** |
| Serotonin-Norepinephrine Reuptake Inhibitors | -FAXINE, -NACIPRAN | Venla**faxine**, Mil**nacipran** |
| Barbiturates | -BARBITAL | Pheno**barbital** |
| Antimigraine | -TRIPTAN | Almo**triptan** |

## OTHER COMMON MEDS

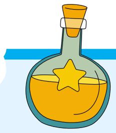
| DRUG TYPE | PREFIX/ SUFFIX | EXAMPLE |
|---|---|---|
| Corticosteroids | -SONE, -LONE, -IDE | Predni**sone**, Budeson**ide** |
| Antihistamines | -INE | Loratid**ine**, Cetiriz**ine** |
| Bisphosphonates | -DRONATE | Alen**dronate** |
| Antidiabetics | -GLIPTIN & -IDE | Sita**gliptin**, Glipiz**ide** |
| Phosphodiesterase Inhibitors | -FIL | Silden**afil** |

# THERAPEUTIC LEVELS & ANTIDOTES

## COMMON THERAPEUTIC LEVELS

| | | | |
|---|---|---|---|
| ACETAMINOPHEN | 10–20 MCG/ML | GENTAMICIN | 5–10 MCG/ML |
| DIGOXIN | 0.5–2.0 MEQ/L | TOBRAMYCIN | 5–10 MCG/ML |
| LITHIUM | 0.6–1.2 MEQ/L | CARBAMAZEPINE | 5–12 MCG/ML |
| PHENYTOIN | 10–20 MCG/ML | VANCOMYCIN | TROUGH 10–20 MCG/ML |
| THEOPHYLLINE | 10–20 MCG/ML | PHENOBARBITAL | 10–40 MCG/ML |
| VALPROIC ACID | 50–100 MCG/ML | PROCAINAMIDE | 4–10 MCG/ML |
| SALICYLATES | 100–300 MCG/ML | AMITRIPTYLINE | 120–150 NG/ML |
| MAG SULFATE | 4–7 MG/DL | AMIODARONE | 0.5–2.5 MCG/ML |

## ANTIDOTES



| DRUG | ANTIDOTE | DRUG | ANTIDOTE |
|---|---|---|---|
| ACETAMINOPHEN | N-ACETYLCYSTEINE | INSULIN | GLUCOSE |
| ANTICHOLINERGICS | PHYSOSTIGMINE | IRON | DEFEROXAMINE |
| ASPIRIN | SODIUM BICARBONATE | ISONIAZID | PYRIDOXINE |
| BENZODIAZEPINES | FLUMAZENIL | LEAD | DEFEROXAMINE |
| BETA BLOCKERS | GLUCAGON | MAG SULFATE | CALCIUM GLUCONATE |
| CHOLINERGICS | ATROPINE | METHANOL | ETHANOL |
| CYANIDE | HYDROXOCOBALAMINE | METHOTREXATE | LEUCOVORIN |
| DIGOXIN | DIGIBIND OR DIGIFAB | NARCOTICS | NALOXONE (NARCAN) |
| DOPAMINE | PHENTOLAMINE | TRICYCLICS | SODIUM BICARBONATE |
| HEPARIN | PROTAMINE SULFATE | WARFARIN | VITAMIN K |

# EMERGENCY MEDS

REMEMBER THESE DRUGS TO LEAN ON

## LIDOCAINE

### ACTION

- Temporary numbing/ pain relief (SQ or topical)
- Suppresses ventricular cells when given IV

### USE FOR:

- Local anesthetic
- Ventricular arrhythmias

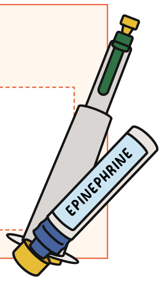
## EPINEPHRINE

### ACTION

- Stimulates alpha & beta adrenergic receptors (blood pressure regulation)
- Relaxes smooth muscle in heart & lungs

### USE FOR:

- Anaphylaxis
- Acute asthma attack
- Cardiac arrest



## ATROPINE

### ACTION

- Increases HR by blocking vagal stimulation
- Blocks acetylcholine (released during "rest & digest" response)

### USE FOR:

- Symptomatic bradycardia
- Reverse anticholinergics

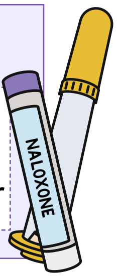
## NARCAN

### ACTION

- Competes for same receptor sites as opioids, reversing their effects

### USE FOR:

- Opioid overdose
- Neonates affected by narcotics given during labor



## OTHER EMERGENCY DRUGS

| AMIODARONE | ADENOSINE | CALCIUM GLUCONATE | SODIUM BICARBONATE |
|---|---|---|---|
| Blocks potassium channels in cardiac cells, delaying repolarization | Activates adenosine receptors in AV node, causing brief asystole so SA node can regain control | Rapidly restores calcium ions in the body (helps regulate contractility & electrical signals in heart) | Neutralizes excess acid in the body to restore normal blood pH levels |
| **USES** | **USES** | **USES** | **USES** |
| **Treat arrhythmias such as:**<br>▸ Ventricular fibrillation<br>▸ Ventricular tachycardia<br>▸ Atrial fibrillation/ flutter | ▸ Supraventricular tachycardia (SVT)<br>▸ Diagnostically during stress test | ▸ Hypocalcemia<br>▸ Hyperkalemia<br>▸ Hypermagnesemia<br>ALL CAN LEAD TO CARDIAC ARREST! | ▸ Severe metabolic acidosis<br>▸ Cardiac arrest (acidosis from prolonged CPR)<br>▸ Certain drug overdoses |

PHARMACOLOGY

NEURO MEDS

# ANTICONVULSANTS

Medications that help prevent & control **SEIZURES** (aka antiepileptics)

## LEVETIRACETAM

**TRADE NAME(S):** Keppra

**DRUG SUBCLASS:** Pyrrolidone Derivatives

### ACTION

Inhibits calcium channels by binding to proteins to ↓ nerve hyperactivity

### USES

- Partial onset seizures
- Myoclonic seizures

### SIDE EFFECTS

- Drowsiness
- Dizziness
- Headache
- Irritability
- Loss of appetite
- Nausea/ vomiting
- Mood changes
- **Suicidal thoughts**

### NURSING CONSIDERATIONS

- Do not abruptly stop medication (can cause seizures!)
- Avoid driving until effects of medication are seen
- Take with food to avoid GI upset

## PHENYTOIN

**TRADE NAME(S):** Dilantin

**THERAPEUTIC LEVEL** 10-20 mcg/ml

### ACTION

Acts as a membrane stabilizer by blocking the voltage of gated sodium channels to inhibit seizure activity

### USES

- Partial seizures
- Generalized tonic-clonic seizures

### SIDE EFFECTS

- **Gingival hyperplasia**
- Nausea
- Rash
- Hypotension

SIGNS OF **TOXICITY**

- Nystagmus
- Slurred speech
- Confusion
- Ataxia

### NURSING CONSIDERATIONS

- Good oral hygiene & regular dental checkups
- No antacids within 3 hours of admin (↓ absorption)
- Decreases affect of meds like oral contraceptives, warfarin & amiodarone
- If given IV: monitor site closely! (can cause extravasation)

## OXCARBAZEPINE

**TRADE NAME(S):** Trileptal

**DRUG SUBCLASS:** Dibenzazepine Carboxamides

### ACTION

Blocks voltage in sodium-sensitive channels to prevent repetitive firing of neurons

### USES

- Partial seizures
- General tonic-clonic seizures
- Mixed seizure types

### SIDE EFFECTS

- Nausea/ vomiting
- Drowsiness
- Dizziness
- Ataxia
- **Hyponatremia**
- **Agranulocytosis**
- **Aplastic anemia**
- **Suicidal thoughts**

### NURSING CONSIDERATIONS

- **Assess for signs of hyponatremia**
- **Monitor CBC and coags**
- Reduces efficacy of oral contraceptives
- Monitor for signs of suicidal ideation or depression

## GABAPENTIN

**TRADE NAME(S):** Neurontin

**DRUG SUBCLASS:** GABA ANALOG

Similar to GABA but acts differently

### ACTION

**Not completely known:** binds to gated calcium channels to decrease excitability of neurons in the brain

### USES

- Adjunct treatment for partial seizures
- Neuropathic pain
- Restless leg syndrome

### SIDE EFFECTS

- Dizziness
- Drowsiness
- Confusion
- Depression
- Weight gain
- GI upset
- Headache
- Blurred vision

### NURSING CONSIDERATIONS

- **Monitor for signs of worsening depression/ suicidal ideation**
- Avoid driving until effects of medication are seen
- Closely monitor in patients prescribed opiates (↑ risk of respiratory depression)
- Avoid CNS depressants (alcohol, antihistamines, chamomile)

# ANTICHOLINERGICS VS. CHOLINERGICS

Medications that prevent or enhance the action of the neurotransmitter ACETYLCHOLINE

**Acetylcholine** allows communication between nerve cells & muscles and plays an essential role in the **PARASYMPATHETIC NERVOUS SYSTEM**

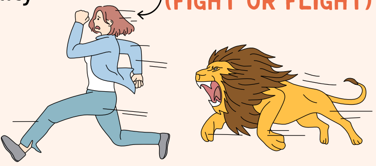
Both drugs have the opposite effect through either stimulation or inhibition of the **PNS** ← **REST & DIGEST RESPONSE**

## ANTICHOLINERGICS

Anticholinergic agents **inhibit** the paraympathetic nervous system by **blocking** acetylcholine

**EFFECTS:**

- Decrease muscle rigidity
- Pupil dilation
- Decrease secretions
- Increase HR
- Bronchial dilation
- Decrease GI motility
- Relax bladder



Inhibiting PNS ends up stimulating SNS (FIGHT OR FLIGHT)

**FIGHT OR FLIGHT MODE= SURVIVAL MODE**

Blood will be shunted to vital organs: **BRAIN, HEART & LUNGS**

### USES

- **PARKINSON'S:** Benztropine
- **COPD/ASTHMA:** Ipratropium
- **OVERACTIVE BLADDER:** Oxybutynin
- **MOTION SICKNESS:** Scopolamine
- **BRADY ARRHYTHMIAS:** Atropine

### SIDE EFFECTS

**HOT** AS A HARE
Decreased sweating leads to **hot and dry skin**

**BLIND** AS A BAT
Dilation of pupils leads to **blurred vision**

**DRY** AS A BONE
Decreased secretions leads to **dry mouth & dry skin**

**RED** AS A BEET
Vasodilation leads to **flushed skin**

**MAD** AS A HATTER
Decreased acetylcholine can lead to **delirium (elderly)**

**ANTIDOTE: PHYSOSTIGMINE**

Although one of their common uses is for neuro disorders, they are both used for many other purposes!

## CHOLINERGICS

Cholinergic drugs **stimulate** the parasympathetic nervous system by **enhancing** acetylcholine

**EFFECTS:**

- Memory enhancement
- Pupil constriction
- Increase secretions
- Decrease HR
- GI stimulant
- Bladder stimulant
- Improve muscle tone

**REMEMBER R IN PARA FOR REST & DIGEST**

Blood can go to other organs: **GI TRACT, KIDNEYS, MUSCLES, ETC.**

### USES

- **ALZHEIMER'S:** Donepezil
- **MYASTHENIA GRAVIS:** Pyridostigmine
- **URINARY RETENTION:** Bethanechol
- **GLAUCOMA:** Pilocarpine

### SIDE EFFECTS

**SALIVATION**
Increased oral secretions

**LACRIMINATION**
Increased tear production

**URINATION**
Increased bladder stimulation

**DIAPHORESIS**
Increased sweat production

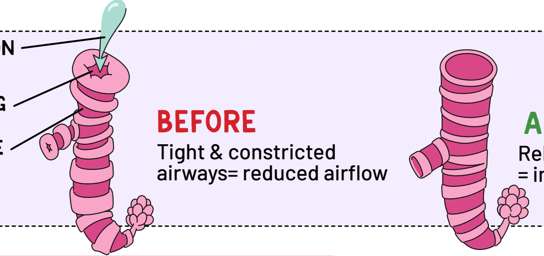
**GI DISTRESS**
Increased GI motility

**EMESIS**
Due to increased secretions & GI motility

**ANTIDOTE: ATROPINE**

# BRONCHODILATORS

Medications that help **relax and open the airways**



**BEFORE**
Tight & constricted airways= reduced airflow

**AFTER**
Relaxed & dilated airways = increased airflow

**Remember BAM for bronchodilators:**

- **B**eta-2 Agonists
- **A**nticholinergics
- **M**ethylxanthines

## BETA-2 AGONISTS

**SUFFIX: –TEROL**

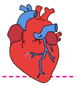
### ACTION

Stimulate **beta-2** receptors in the smooth muscle of the airways

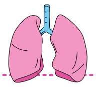
**MEMORY TRICK**

You have **ONE** heart & **TWO** lungs

Beta-1 affects the **HEART**



Beta-2 affects the **LUNGS**



### USES

**SABAs** (Short Acting Beta Agonists)

**Acute** symptom relief
- Bronchospasm
- Acute asthma attack

REMEMBER **A** IN **A**LBUTEROL FOR **A**CUTE ACTION

**LABAs** (Long Acting Beta Agonists)

**Long term** management
- Asthma and COPD
- Combination therapy

REMEMBER **S** IN **S**ALMETEROL FOR **S**LOW & STEADY

### SIDE EFFECTS

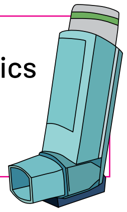
- → Tachycardia
- → Palpitations
- → Tremors or shakiness
- → Nervousness
- → Dizziness
- → Dry mouth
- → Insomnia

Think **FIGHT OR FLIGHT** response

Beta-2 receptors are part of the **sympathetic nervous system** aka fight or flight

### EDUCATION

- ★ **Give first** when used in combination with steroids or anticholinergics
- ★ Rinse mouth after administration to avoid dry mouth/ thrush
- ★ LABA's can **only** be used in combination with inhaled steroids



## ANTICHOLINERGICS

**SUFFIX: –TROPIUM**

### ACTION

Block acetylcholine in bronchial smooth muscle leading to bronchodilation and decreased mucous production

### EDUCATION

Suck on sugarless hard candies or increase fluid intake to avoid dry mouth (from ↓ secretions)

### USES

- → COPD
- → Asthma
- → Chronic bronchitis

**CAN BE SHORT ACTING OR LONG ACTING**

**REMEMBER:**

**I**patropium is short acting & works **I**mmediately

**T**iotropium is long acting & takes **T**ime to work

### SIDE EFFECTS

- → **CAN'T SEE:** blurred vision
- → **CAN'T PEE:** dysuria
- → **CAN'T SPIT:** ↓ secretions
- → **CAN'T S**T:** constipation

See **Anti-cholinergics vs. Cholinergics** page for more memory tricks!

## METHYLXANTHINES

**SUFFIX: –PHYLLINE**

### ACTION

Inhibit the enzyme phosphodiesterase & suppress airway responsiveness to stimuli to relax bronchial smooth muscle

### EDUCATION

- ★ Avoid caffeine!
- ★ Monitor blood levels (for theophylline)

There is **no antidote** for theophylline

### USES

Long term management of asthma & COPD

Used for **prevention** of symptoms in asthma & COPD not relieved by beta-2 agonists & inhaled corticosteroids

Main drug to know is **THEOPHYLLINE**

**THERAPEUTIC LEVEL**
10-20 mcg/ml

**SIGNS OF TOXICITY**
- **Dysrhythmias**
- **Seizures**

### SIDE EFFECTS

- → Tachycardia
- → Palpitations
- → Nervousness
- → Irritability
- → Dizziness
- → GI upset
- → Insomnia

All side effects of **CAFFEINE!**

Xanthines are **caffeine derivatives**

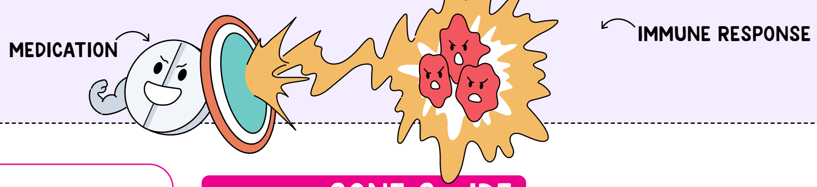
# ANTI-INFLAMMATORY AGENTS

Medications that help reduce inflammation in the airways to **decrease airway narrowing, mucous production & hyper-responsiveness**

Remember SLM for anti- inflammatories:

- **S**teroids
- **L**eukotriene Modifiers
- **M**ast Cell Stabilizers

### TARGET DIFFERENT PARTS OF THE INFLAMMATORY CASCADE BY MODULATING IMMUNE RESPONSE



## STEROIDS

SUFFIX: -SONE & -IDE

### ACTION

Reduce inflammatory response by suppressing immune system activity

- **Inhaled steroids** work locally with minimal systemic side effects & used for long term management
- **Systemic steroids** work system wide & can be used in acute and chronic conditions

### USES

#### ACUTE USES

- Asthma attack
- COPD exacerbation
- Anaphylaxis
- Gout attack
- MS relapse
- IBD flare up

#### LONG TERM USES

- Asthma
- COPD
- IBD
- IBD
- RA
- Lupus

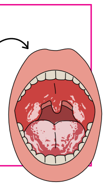
PO/IV has **multiple** other uses besides respiratory conditions

### SIDE EFFECTS

- **S**ugar: hyperglycemia
- **S**wollen: fluid retention
- **S**ick: immunosuppression
- **S**ight: risk for cataracts
- **S**oft bones: risk for osteroporosis
- **S**tarving: Increased appetite

### EDUCATION

- **Rinse mouth after to avoid oral thrush (type of yeast infection)**
- **Never** stop abruptly; always taper off slowly
- May need to increase dose during stress or surgery



### IMPORTANT TO MONITOR FOR:

- Sudden weight gain/ edema
- Signs of infection
- Blood sugars (especially if diabetic)
- Eye health: regular check ups

## LEUKOTRIENE MODIFIERS

SUFFIX: -LUKAST

### ACTION

Block **leukotrienes**, inflammatory mediators produced by immune cells in response to allergens or triggers

### EDUCATION

- ⭑ Take montelukast 2 hours before exercise
- ⭑ Take zafirlukast on empty stomach

### USES

- Asthma
- Allergic rhinitis
- Exercise-induced bronchoconstriction

**NOT A RESCUE DRUG!**

Leukotriene modifiers are used for long term management only and are not effective in treating acute symptoms

### SIDE EFFECTS

- Headache
- GI upset
- Sore throat
- Cold symptoms
- ↑ liver enzymes **(zafirlukast only)**

## MAST CELL STABILIZERS

DRUG: CROMOLYN

### ACTION

Prevent release of inflammatory mediators from **mast cells**, immune cells that release histamines & leukotrienes

### EDUCATION

- ⭑ Take 15 minutes before physical activity
- ⭑ Admin on a regular fixed schedule to maintain therapeutic level

### USES

- Asthma
- Allergic rhinitis
- Exercise-induced bronchoconstriction

**NOT A RESCUE DRUG!**

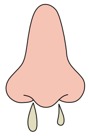
Mast cell stabilizers are also used for long term management only and are not effective in treating acute symptoms

### SIDE EFFECTS

- Cough
- Postnasal drip
- Bitter taste in mouth
- Nose & throat irritation
- **Bronchospasm**

Using a spacer may help prevent this

# SECRETION & ALLERGY MANAGEMENT



Medications that help **reduce or break down mucous** and **relieve congestion & common allergy symptoms**

## EXPECTORANTS

**DRUG: GUAIFENESIN**

### ACTION

Signals body to pull water into mucous secretions

↓

Reduces their viscosity (thins them) so they can be easier coughed up (**expectorated**)

### USES

**Relieves chest congestion in disorders such as:**

- → COPD
- → Asthma
- → Cystic fibrosis
- → Common cold
- → Pneumonia

### SIDE EFFECTS

- → GI upset
- → Rash
- → Dizziness
- → Headache

### EDUCATION

- ★ Ensure adequate fluid intake
- ★ Encourage coughing and deep breathing
- ★ No eating or drinking for 30 minutes after administration

## MUCOLYTICS

**DRUG: N-ACETYLCYSTEINE** ← MUCOMYST

### ACTION

Break down molecules in mucous for it to become less viscous (thick) to make secretions easier to cough up

**Has a strong (and unpleasant) sulfur smell like rotten eggs that is completely normal!**

### USES

**Relieves chest congestion in disorders such as:**

- → COPD
- → Cystic fibrosis
- → Common cold
- → Pneumonia

**ANTIDOTE FOR ACETAMINOPHEN OVERDOSE**

### SIDE EFFECTS

- → GI upset
- → Rash
- → Dizziness
- → Headache
- → **Bronchospasm**

Use cautiously in asthma patients

### EDUCATION

- ★ Ensure adequate fluid intake
- ★ Encourage coughing and deep breathing
- ★ Use cautiously in asthma or history of bronchospasm

## DECONGESTANTS

**SUFFIX: -RINE** ← PSEUDOEPHEDRINE, PHENYLEPHRINE

### ACTION

Stimulates alpha adrenergic receptors in the respiratory mucosa, causing vasoconstriction, which leads to **decreased inflammation in the sinus tract**

Pseudoephedrine is a key ingredient used to make the illicit drug **meth & is a controlled OTC medication**

### USES

**Relieves nasal congestion in disorders such as:**

- → Allergic rhinitis
- → Sinusitis
- → Common cold

### SIDE EFFECTS

- → Tachycardia
- → Nervousness
- → Palpitations
- → Insomnia
- → Headache

Think side effects of using a **stimulant** drug

### EDUCATION

- ★ Don't take for longer than 7 days, can **cause rebound congestion!**
- ★ Check with MD before taking if cardiac history is present

## ANTIHISTAMINES

**SUFFIX: -MINE, -ZINE, -DINE**

### ACTION

Block **histamine H1 receptors** to prevent histamines from binding and producing immune response

**1ST GEN**

Diphenhydramine (Benadryl)

**2ND GEN**

- ▸ Cetirizine (Zyrtec)
- ▸ Loratadine (Claritin)
- ▸ Fexofenadine (Allegra)

### USES

**Treat allergy symptoms in disorders such as:**

- → Allergic rhinitis
- → Seasonal allergies
- → Allergic reactions
- → Uticaria (hives)
- → Allergic conjunctivitis

### SIDE EFFECTS

**1ST GEN**

- → Drowsiness
- → Dry mouth
- → Urinary retention
- → Constipation

Have **anticholinergic** effects

**2ND GEN**

Less sedating & less side effects overall

### EDUCATION

- ★ Avoid driving or operating heavy machinery (mainly in 1st gen)
- ★ Avoid alcohol use or other CNS depressants

# CARDIAC PHARM OVERVIEW

There are multiple ways to group & classify cardiac meds as they have many different uses/ characteristics. The cardiac meds in this section are grouped by **main action.**

This will help you better understand how they work so you can naturally understand what the effects and indications of each medication are. But first let's review the basics of cardiac pharmacology:

## ADRENERGIC RECEPTORS

Adrenergic receptors are proteins found on the surfaces of cells that respond to **epinephrine & norepinephrine** (hormones secreted by adrenals responsible for fight or flight).

REMEMBER A FOR ARTERIES IN ALPHA

REMEMBER YOU HAVE ONE HEART= BETA 1

REMEMBER YOU HAVE TWO LUNGS= BETA 2

| | ALPHA 1 | ALPHA 2 | BETA 1 | BETA 2 |
|---|---|---|---|---|
| LOCATION | **Arteries** throughout the body (except skeletal muscle) | **Arteries** throughout the body (except skeletal muscle) | **Heart** & juxtaglomerular cells in kidneys | **Lungs** + eyes & arteries of skeletal muscles |
| ACTION | Vaso**constriction** of arteries | Vaso**dilation** of arteries | ▸ ↑ heart contractility<br>▸ ↑ heart rate | ▸ dilates bronchioles<br>▸ dilates skeletal muscle arterioles |
| RESULT | ▸ ↑ SVR<br>▸ ↑ blood pressure | ▸ ↓ SVR<br>▸ ↓ blood pressure | ▸ ↑ stroke volume<br>▸ ↑ cardiac output | ▸ ↓ SVR<br>▸ ↓ blood pressure |

Their normal action when **stimulated**

**AGONIST= STIMULATE**

Meds that **promote** the natural action of the receptor

**ANTAGONIST= BLOCK**

Also called **INHIBITORS**

Meds that **prevent** the natural action of the receptor

## CARDIAC FUNCTIONING

**HR (HEART RATE)** x **SV (STROKE VOLUME)** = **CO (CARDIAC OUTPUT)**

HR: Number of times heart pumps per minute

SV: Volume of blood ejected in each heartbeat

CO: Volume of blood ejected per minute

**CO (CARDIAC OUTPUT)** X **SVR (SYSTEMIC VASCULAR RESISTANCE)** = **BP (BLOOD PRESSURE)**

CO: Volume of blood ejected per minute

SVR: Measurement of **afterload**

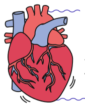
Resistance the left ventricle must overcome to pump blood to the body

BP: The amount of resistance of blood pumping through arteries

If any of these factors are affected, the others are affected as well!

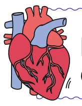
The goal of cardiac meds is to **OPTIMIZE CARDIAC FUNCTIONING**

This could indicate **lowering** or **increasing** factors in either equation depending on the patient's condition, but the main factors influenced are:



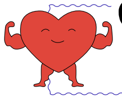
**PRELOAD**

Amount of blood in the ventricles at end of diastole



**AFTERLOAD**

Resistance ventricles must overcome to pump blood out



**CONTRACTILITY**

The strength of each heart contraction

**HEART RATE**

Directly linked to preload, afterload & contractility

CARDIAC MEDS

# ADRENERGIC BLOCKERS

Meds that **block adrenergic receptor stimulation** to **DECREASE BLOOD PRESSURE**

## ALPHA-1 BLOCKERS

**SUFFIX:**

-ZOSIN

**EXAMPLES:**

- Daxazosin (Cardura)
- Prazosin (Minipress)
- Terazosin

Alpha 1 & Alpha 2 have **opposing actions**

**NOTE:**
**Alpha 2 agonists** work to *stimulate* alpha 2 receptors (opposite to alpha 1 blockers) to cause vasodilation **(Example:** Clonidine)

### ACTION

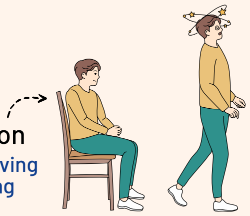
Inhibit (block) alpha-1 adrenergic receptors, leading to **smooth muscle relaxation & vasodilation**

### USES

- → Hypertension
- → Benign prostatic hyperplasia (relax smooth muscle in bladder & prostate)

### SIDE EFFECTS

- → **"First-dose phenomenon"**
  Severe & sudden drop in blood pressure after first time admin of med
  - Palpitations
  - Reflex tachycardia
  - Dizziness
  - Syncope
  - Orthostatic hypotension
    Sudden drop in bp when moving from lying/sitting to standing
- → Fluid & sodium retention



### NURSING CONSIDERATIONS

- → Monitor blood pressure & HR (especially after first dose)
- → Change positions slowly
- → **Do not abruptly stop taking;** can cause rebound hypertension!

## BETA BLOCKERS

**SUFFIX:**

-OLOL

**DIFFERENT TYPES OF BB:**

- Selective (only affect beta 1)
- Non-selective (affect beta 1 & 2)

**SELECTIVE**

- Metoprolol
- Atenolol
- Esmolol

**NON-SELECTIVE**

- Propanolol
- Labetalol
- Carvedilol

### ACTION

Inhibit (block) beta adrenergic receptors, leading to **decreased heart rate, contractility & workload on heart**

### USES

- → Hypertension
- → Stable angina
- → Dysrhythmias
- → Heart failure (chronic)
- → Myocardial infarction
- → Glaucoma (Timolol)

### SIDE EFFECTS

- → Bradycardia
- → Hypotension
- → Hypoglycemia
  May mask symptoms in diabetic patients; need to monitor closely
- → Dizziness
- → **Bronchospasm (in non-selective)**
  Contraindicated in asthma & COPD
- → Signs of heart failure
  - Weight gain
  - Edema
  - Shortness of breath

### NURSING CONSIDERATIONS

- → **Monitor blood pressure & HR**
- → Diabetic patients need to closely monitor sugars
- → Change positions slowly
- → Do not abruptly stop taking; can cause rebound hypertension!

CARDIAC MEDS

# RAAS INHIBITORS

Meds that **block part of the Renin-Angiotensin-Aldosterone System** to **DECREASE BLOOD PRESSURE** (see *Renal System Overview* page for full RAAS breakdown)

1ST CHOICE

## ACE INHIBITORs

**A**NGIOTENSIN **C**OVERTING **E**NZYME

**SUFFIX:**

-PRIL

**EXAMPLES:**

- Enalapril (Vasotec)
- Lisinopril (Zestril)
- Ramipril (Altace)

### ACTION

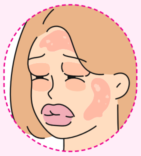
Inhibits conversion of Angiotensin I to **Angiotensin II**, preventing vasoconstriction & water/ sodium retention, leading to decreased blood pressure

### USES

- → Hypertension
- → Heart failure
- → Myocardial infarction

### SIDE EFFECTS

- → **Dry cough**
- → **Angioedema**
- → **Hyperkalemia**
- → Dizziness
- → Hypotension



Will be switched to ARB if cannot tolerate ACE

### NURSING CONSIDERATIONS

- → Monitor blood pressure & HR
- → **Do not abruptly stop taking;** can cause rebound hypertension!
- → Report any type of swelling **immediately**
- → Contraindicated in pregnancy; teratogenic to fetus
- → **High risk of hyperkalemia** (especially if taking with potassium-sparing diuretic)
  - Avoid foods high in potassium + salt substitutes with potassium

**AVOID FOODS LIKE:**

- Bananas
- Potatoes
- Spinach
- Oranges
- Tomatoes
- Fish

2ND CHOICE

## ARBs

**A**NGIOTENSIN **R**ECEPTOR **B**LOCKER

**SUFFIX:**

-SARTAN

**EXAMPLES:**

- Losartan (Cozaar)
- Valsartan (Diovan)
- Olmesartan (Benicar)

### ACTION

Inhibits the action of **Angiotensin II**, preventing vasoconstriction & water/ sodium retention, leading to decreased blood pressure

### USES

- → Hypertension
- → Heart failure
- → Myocardial infarction

### SIDE EFFECTS

Same symptoms **except cough**

- → **Angioedema** (less common)
- → **Hyperkalemia**
- → Dizziness
- → Hypotension

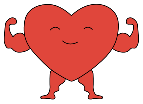
### NURSING CONSIDERATIONS

- → Monitor blood pressure & HR
- → **Do not abruptly stop taking;** can cause rebound hypertension!
- → Report any type of swelling **immediately**
- → Contraindicated in pregnancy; teratogenic to fetus
- → **High risk of hyperkalemia** (especially if taking with potassium-sparing diuretic)
  - Avoid foods high in potassium + salt substitutes with potassium

**AVOID FOODS LIKE:**

- Bananas
- Potatoes
- Spinach
- Oranges
- Tomatoes
- Fish

# CARDIOTONIC AGENTS



Meds that **have positive inotropic effects (increase cardiac contracility)**, meaning they make the heart pump stronger, leading to ↑ **cardiac output**

## DIGOXIN

**CLASS: CARDIAC GLYCOSIDE**

**THERAPEUTIC RANGE**
0.5-2 ng/dL

### ACTION

- **Positive inotrope:** causes heart to beat harder
- **Negative chronotrope:** causes heart to beat slower
- **Negative dromotrope:** slows impulses through the AV node

Heart beats **STRONGER & SLOWER**
Does **NOT** affect blood pressure

### USES

- Heart failure
- A. fib/ A. flutter
- Cardiogenic shock

### SIGNS OF TOXITY

- Nausea & vomiting
- Anorexia
- Vision changes
- Dizziness

### NURSING CONSIDERATIONS

- Monitor kidney function (Creatinine + BUN); **worsened kidney function= ↑ risk of toxicity**
- **Monitor K levels;** ↓ K+= ↑ **risk of toxicity**
- Potassium rich diet
- Regularly monitor digoxin levels & electrolytes
- Assess **apical pulse** for one full minute before administering
  - Hold for HR < 60 bpm

## MILRINONE

**CLASS: PHOSPHODIESTERASE 3 INHIBITOR**

### ACTION

Inhibits phosphodiesterase 3, which leads to a positive inotropic effect of **increased contractility** as well as **peripheral vasodilation**

**ADMINISTERED AS IV INFUSION**

### USES

- Acute heart failure
- Chronic heart failure
- Cardiogenic shock

Used as last line therapy for heart failure patients or during palliative care to increase quality of life

### SIDE EFFECTS

- Headaches
- Hypotension
- **Ventricular arrhythmias**
- Thrombocytopenia
- Hypokalemia

### NURSING CONSIDERATIONS

- Daily weights
- Strict I & O
- Monitor VS & ECG
- Monitor CBC, BMP, coags

**Usually given inpatient but may go home on it (will require PICC line)**

## DOBUTAMINE

**CLASS: BETA 1 AGONIST**

### ACTION

Stimulates beta-1 receptors to **increase myocardial contractility & stroke volume**, leading to increased cardiac output

**ADMINISTERED AS IV INFUSION**

### USES

- Acute heart failure
- Cardiogenic shock
- S/p cardiac surgery

### SIDE EFFECTS

- Hypertension
- Tachycardia
- **Ventricular arrhythmias**

### NURSING CONSIDERATIONS

- **Vesicant; monitor IV site closely!** (central line for long term use)
- Continuous VS & ECG monitoring
- Strict I & O
- Monitor electrolytes (may lead to hypokalemia)
- Invasive monitoring (CVP & PWCP) if available
- **MAOI & TCA antidepressants increase potency of dobutamine**

## DOPAMINE

**CLASS: CATECHOLAMINE**

**VASOPRESSOR**

### ACTION

- Stimulates alpha-1 receptors leading to **vasocontriction**
- Stimulates beta-1 receptors leading to ↑ HR & ↑ CO
- Stimulates dopaminergic receptors leading to ↑ **renal perfusion**

**ADMINISTERED AS IV INFUSION**

### USES

- Bradycardia
- Shock

### SIDE EFFECTS

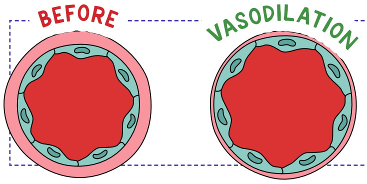
- Palpitations
- Headaches
- **Ventricular arrhythmias**

### NURSING CONSIDERATIONS

- **Vesicant; monitor IV site closely!** (central line for long term use)
- Continuous VS & ECG monitoring
- Strict I & O
- Monitor electrolytes (may lead to hypokalemia)
- Invasive monitoring (CVP & PWCP) if available

CARDIAC MEDS

# VASODILATORS



Meds that **cause relaxation and dilation of the arteries** so blood can flow more freely & reduce workload on the heart

## CALCIUM CHANNEL BLOCKERS

**SUFFIX: –DIPINE, –ZEM, –MIL**

### ACTION

Prevents calcium from entering cardiac cells which **relaxes heart and/or vascular smooth muscle**

**–PINEs ONLY LOWER BP**
Ex: Nicardipine, Amlodipine

**–ZEMs & –MILs LOWER BP & HR**
Ex: Cardizem, Verapamil

### USES

- Hypertensive crisis
- Angina

### SIDE EFFECTS

- Orthostatic hypotension
- Constipation (Verapamil)
- Gingival hyperplasia (-PINE)
- Headache
- Flushing
- Peripheral edema

### NURSING CONSIDERATIONS

- ★ Check BP & HR before admin
  - Hold for HR < 60 bpm or SBP <100
- ★ Change positions slowly
- ★ **AVOID grapefruit! can cause toxicity**
- ★ Contraindicated in heart block patients
- ★ High fiber diet to prevent constipation

## NITRATES

**NITROGLYCERINE & ISOSORBIDE**

### ACTION

Converts to nitric oxide which is then converted into a protein that causes vasodilation which leads to:

- ↑ blood flow to heart
- ↓ vascular resistance
- ↓ O2 consumption

### USES

- Hypertensive crisis
- Angina
- Heart failure

### SIDE EFFECTS

- Headache
- Flushing
- Orthostatic hypotension

### NURSING CONSIDERATIONS

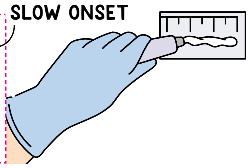
- ★ Check BP before admin
  - Hold for SBP <100 or drop >30mmhg
- ★ **Do not give with PDE 5 Inhibitors** (Sildenafil aka Viagra)
  Can result in life threatening hypotension!
- ★ **Sublingual nitro:** 3 doses 5 minutes apart
  - If pain not relieved or worse 5 minutes after first dose, call 911
- ★ Must be kept in original dark container

NITROGLYCERIN

### ROUTES OF ADMINISTRATION

FAST ONSET
- Sublingual
- IV infusion
- Intranasal spray

SLOW ONSET
- SR tablet
- Transdermal patch
- Transdermal paste



### ALWAYS WEAR GLOVES WITH PATCH OR PASTE

The medication from the patch or paste can easily absorb into your skin, causing **hypotension**

- Never rub paste into patient's skin; can cause rapid absorption
- **Always remove previous patch before applying a new one**

## HYDRALAZINE

APRESOLINE

**CLASS: DIRECT VASODILATORS**

### ACTION

Directly relaxes arteriole smooth muscle, resulting in peripheral vasodilation and leads to:

- ↓ afterload
- ↓ workload of heart
- ↓ blood pressure

### USES

- Severe hypertension
- Heart failure

### SIDE EFFECTS

- Hypotension
- Drug-induced lupus
- Reflex tachycardia

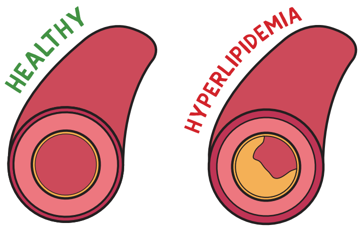
### NURSING CONSIDERATIONS

- ★ Monitor BP regularly
- ★ Contraindicated for use in angina
- ★ Drops blood pressure quickly which can lead to reflex tachycardia; often used with beta blocker
- ★ MAOI's may increase potency of hydralazine leading to hypotension
- ★ **Do not give with PDE 5 Inhibitors** (Sildenafil aka Viagra)

CARDIAC MEDS

# ANTIHYPERLIPIDEMICS

Meds that **reduce lipid levels** in the blood



## HDL

**H**APPY cholesterol
Want levels HIGH
**>60 MG/DL**

## LDL

**L**OUSY cholesterol
Want levels LOW
**<100 MG/DL**

## OTHER VALUES

TOTAL CHOLESTEROL
**<200 MG/DL**
TRIGLYCERIDES
**<150 MG/DL**

## HMG-COA REDUCTASE INHIBITORS

SUFFIX: -STATIN

### ACTION

Inhibit HMG-CoA reductase, enzyme responsible for cholesterol synthesis in the liver

Lowers LDL & increases HDL
Increased HDL helps remove LDL

NOT A CURE
Diet & exercise is vital to tx of HLD

### USES

- Hyperlipidemia
- Preventative treatment
  - Patients with atherosclerosis
  - Stabilizes fatty plaques in CAD patients

### SIDE EFFECTS

- GI upset
- Constipation
- Muscle pain
- Nausea
- **Liver toxicity**
- **Rhabdomyolysis**

### NURSING CONSIDERATIONS

- ⋆ Monitor liver enzymes
- ⋆ Monitor for signs of rhabdo
- ⋆ **AVOID grapefruit! can cause toxicity**
- ⋆ Contraindicated in pregnancy
- ⋆ Some statins have short half-life; take in evening (most cholesterol produced at night)

## BILE ACID RESINS

PREFIX: CHOLE- & COLE-

### ACTION

Bind to bile acids in the intestine to increase excretion of cholesterol and lower LDL levels

EXCRETED IN THE STOOL

Lowers LDL levels

### USES

- Hyperlipidemia

Can be used alone or with -STATINs

### SIDE EFFECTS

- Constipation
- GI upset
- **Cholesterol gallstones**

### NURSING CONSIDERATIONS

- ⋆ Interferes with absorption of fat soluble vitamins
  - Vitamins A, D, E & K
  - THINK A **FAT DECK** OF CARDS
- ⋆ Increase fiber and fluid intake to prevent constipation
- ⋆ Monitor for signs of gallstones (RUQ pain after fatty meal, N/V)

- Gem**FIB**rozil
- Feno**FIB**rate
- Clo**FIB**rate

## FIBRATES

ROOT: -FIB-

### ACTION

Activate PPAR alpha receptors to stimulate increased production of liproprotein lypolysis

- Lowers TRIGLYCERIDES
- Increases HDL
- Slight decrease in LDL

### USES

- Hypertriglyceridemia

### SIDE EFFECTS

- GI upset
- Gallstones
- Muscle pain
- **Liver toxicity**

### NURSING CONSIDERATIONS

- ⋆ Give 30 minutes before breakfast & dinner
- ⋆ Monitor LFT & CK levels
- ⋆ Do not use with statins (increases risk of rhabdo)
- ⋆ Increases effects of warfarin; monitor coags
- ⋆ Monitor for signs of gallstones (RUQ pain after fatty meal, N/V)

## CARDIAC MEDS

# DIURETICS

Meds that **promote diuresis (urination)**
to remove extra fluid from the body

## LOOP DIURETICS

SUFFIX: –IDE

### ACTION

Blocks absorption of **sodium, chloride & water** and increases excretion of **potassium, magnesium & calcium** in the urine

### USES

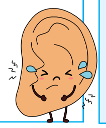
- → Volume overload
- → Pulmonary edema
- → Renal disease
- → Hypertension
- → Heart failure
- → Liver disease

### SIDE EFFECTS

- → **Hypokalemia**
- → **Hyponatremia**
- → Hypotension
- → Dehydration
- → Hyperglycemia
- → **Ototoxicity**

### NURSING CONSIDERATIONS

- ★ Check BP before admin
- ★ Daily weights
- ★ Monitor I & O
- ★ Give **SLOWLY** (20mg/min)
  - ☛ Fast administration can cause **ototoxicity**
- ★ Monitor electrolytes (encourage K+ foods)



## THIAZIDE DIURETICS

SUFFIX: –THIAZIDE

### ACTION

Block absorption & promote excretion of **Na, Cl & H20**

**LOW CEILING DIURETIC:** After certain dose, response does not ↑ efficacy

### USES

- → **Hypertension**
- → **Heart failure** (usually with other med)
- → **Liver disease**

### SIDE EFFECTS

- → **Hypokalemia**
- → **Hyponatremia**
- → Hypercalcemia
- → Hyperuricemia
- → Hypotension
- → Dehydration

### NURSING CONSIDERATIONS

- ★ Check BP before admin
- ★ Monitor electrolytes
- ★ Monitor I & O
- ★ Daily weights
- ★ Encourage K+ rich foods
- ★ Avoid in patients with gout (increases uric acid)

## POTASSIUM SPARING DIURETICS

SPIRONOLACTONE

### ACTION

Blocks aldosterone, leading to excretion of sodium & water

**DOES NOT EXCRETE POTASSIUM**
aka "potassium sparing"

### USES

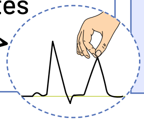
- → Hypertension
- → Heart failure
- → Liver disease
- → Nephrotic syndrome
- → Hyperaldosteronism

### SIDE EFFECTS

- → **Hyperkalemia**
- → Hyponatremia
- → GI upset
- → Amenorrhea
- → Gynecomastia
- → Erectile dysfunction

### NURSING CONSIDERATIONS

- ★ Monitor BP
- ★ Daily weights
- ★ Monitor electrolytes
- ★ Avoid potassium rich foods + salt substitutes
- ★ Monitor for signs of hyperkalemia
  (muscle cramps, dysrythmias, peaked T waves)



## OSMOTIC DIURETICS

MANNITOL

### ACTION

**Increases serum osmolality** to draw fluid from intracellular into interstitial space + bloodstream

### USES

- → Cerebral edema causing ↑ ICP
- → Increased intraocular pressure (glaucoma)

### SIDE EFFECTS

- → **Fluid volume overload**
  - ▶ Pulmonary edema
  - ▶ Jugular vein distention
  - ▶ Peripheral edema
- → Hypotension
- → Dehydration

### NURSING CONSIDERATIONS

- ★ Monitor neuro status
- ★ Monitor ICP
- ★ Monitor admin site (only given IV)
- ★ Monitor I & O + signs of fluid overload
- ★ Monior VS & EKG + electrolytes
- ★ Drug can crystallize, assess before giving

CARDIAC MEDS

# ANTICOAGULANTS

Meds that **prevent growth of present clots as well as formation of new clots**

## BLEEDING PRECAUTIONS

IMPLEMENT FOR ALL

- NO aspirin
- Soft toothbrush
- Electric razor only
- Avoid straining with BM's
- Avoid contact sports
- Decrease needle sticks
- Fall precautions
- Medic alert bracelet
- Avoid forceful coughing or blowing nose

## HEPARIN

### ACTION

Inactivates **thrombin** and **factor Xa** to inhibit formation of fibrin clots

### LOW MOLECULAR WEIGHT HEPARIN

SUFFIX: –PARIN → **Enoxaparin** (Lovenox)

Only given SQ & patients can go home on it (adjusted for **renal impairment**)

Monitor **PLATELETS**, not **APTT**

### USES

HEPARIN SODIUM

→ Short term therapy
- Administered IV infusion or SQ
- IV gtt is weight based (must be within therapeutic range to work)

### ANTIDOTE: PROTAMINE SULFATE

⋆ Monitor aPTT for IV (based on facility protocol)

THERAPEUTIC GOAL: 1.5– 2 TIMES NORMAL RANGE

→ **NORMAL RANGE:** 47-70 seconds

### SIDE EFFECTS

**BLEEDING**
- Oozing IV site
- Bleeding gums
- Nose bleeds
- Hematuria or melena

### HEPARIN INDUCED THROMBOCYTOPENIA

Body makes antibodies against heparin which attach to platelets, causing low platelet levels

**STOP HEPARIN**

## WARFARIN

COUMADIN

### ACTION

Suppresses **Vitamin K** in clotting cascade & inhibits prothrombin

### USES

COUMADIN
2 1/2

→ Long term therapy
- Administered PO
- Can take up to 5 days to work
- Dose adjusted based on INR

### SIDE EFFECTS

**BLEEDING**
- Oozing IV site
- Bleeding gums
- Nose bleeds
- Hematuria or melena

### NURSING CONSIDERATIONS

- ⋆ Contraindicated in pregnancy (teratogenic)
- ⋆ **Must be consistent with Vitamin K intake** (leafy greens)
- ⋆ Regular INR monitoring
- ⋆ Take at the same time everyday

### ANTIDOTE: VITAMIN K & FFP

Monitor INR **(goal 1.5-2 times normal)**

→ NORMAL RANGE: 2–3

## DIRECT ORAL ANTICOAGULANTS

SUFFIX: –BAN & –TRAN

- Apaxi**BAN** (Eliquis)
- Rivaroxa**BAN** (Xarelto)
- Dabiga**TRAN** (Pradaxa)

### ACTION

Directly inhibit **factor Xa** or **thrombin** to prevent clotting

### USES

→ Long term therapy
- Administered PO
- Less monitoring required compared to coumadin

### SIDE EFFECTS

**BLEEDING**
- Oozing IV site
- Bleeding gums
- Nose bleeds
- Hematuria or melena

### NURSING CONSIDERATIONS

- ⋆ All recently developed medications
- ⋆ No frequent monitoring required
- ⋆ No need to limit Vitamin K intake
- ⋆ Notify PCP before invasive dental procedures
- ⋆ Monitor for signs of excess bleeding

### ANTIDOTES (recently developed)

**ANDEXXA:** Eliquis & Xarelto

**IDARUCIZUMAB:** Pradaxa

CARDIAC MEDS

# VASOPRESSORS

Meds that cause vasoconstriction to **PRESS** on the blood vessels and **increase blood pressure**

USUALLY >65

**TITRATED TO MAINTAIN A SET MAP (MEAN ARTERIAL PRESSURE)**

## ALWAYS GIVE FLUIDS FIRST!

NORMAL SALINE

Vasopressors are given only if the patient's blood pressure is unresponsive to fluids (or contraindicated)

## FOR ALL VASOPRESSORS:

- Administered in ICU setting for severe hypotension
- Requires continuous hemodynamic monitoring + strict I & O
- Requires central line (for long term use)
- If given peripherally, only for short term and must closely monitor IV site for signs of infiltration

→ if epinephrine or dopamine infiltrates, keep IV in and give **PHENTOLAMINE**

## NOREPINEPHRINE

**ALPHA 1 & BETA 1 AGONIST**

### ACTION

**STIMULATES ALPHA 1**

Causes vasoconstriction leading to ↑ **vascular resistance**

**STIMULATES BETA 1 (MINOR)**

Increases contractility & HR leading to ↑ **stroke volume**

### KEY INFO

- → 1st line pressor in septic shock
  - **Only if BP still low after fluids**
- → Can cause **tachyarrhythmias** (due to beta 1 stimulation)

NOREPINEPHRINE
8 MG
HIGH ALERT

## PHENYLEPHRINE

**ALPHA 1 AGONIST**

### ACTION

**STIMULATES ALPHA 1**

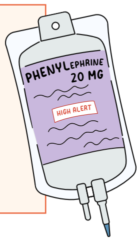
Causes vasoconstriction leading to ↑ **vascular resistance**

**NO EFFECT ON CONTRACTILITY**

Usually used as adjunct therapy (2nd pressor or tachy from levophed) or in hypotensive patients without contractility issues

### KEY INFO

- → Can be given as IV infusion or bolus dose pressor
- → Can cause **reflex bradycardia** (due to baroreceptor reflex)



## EPINEPHRINE

**ALPHA 1 & BETA 1 + 2 AGONIST**

### ACTION

**STIMULATES ALPHA 1:** Causes vasoconstriction leading to ↑ **vascular resistance**

**STIMULATES BETA 1:** Increases contractility & HR leading to ↑ **stroke volume**

**STIMULATES BETA 2:** Causes bronchodilation

### KEY INFO

- → 1st line treatment in cardiac arrest
- → Given for anaphylaxis
- → Can cause **tachyarrhythmias** & **lactic acidosis**
- → IV gtt usually last line treatment

EPINEPHRINE
1 MG
HIGH ALERT

## VASOPRESSIN

**V1 & V2 AGONIST**

### ACTION

**STIMULATES VASOPRESSIN 1**

Causes vasoconstriction leading to ↑ **vascular resistance**

**STIMULATES VASOPRESSIN 2**

Causes water retention leading to ↑ **fluid volume**

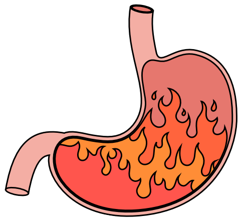
### KEY INFO

- → Usually used as gtt in combination with norepinephrine
- → Given for diabetes insipidus as IVP
- → Not titrated (ordered at set dose)

VASOPRESSIN

*See Cardiotonic Agents page for* ***Dopamine & Dobutamine***

# ACID SUPPRESSING AGENTS



Meds that **suppress or neutralize acid in the stomach** leading to a reduction in symptoms & prevention from:

① GERD (Gastroesophageal reflux)
② Gastritis (Inflammation of stomach lining)
③ Duodenal or peptic ulcers (sore in lining of mucosa)

## ANTACIDS

### ACTION

**Immediately neutralizes stomach** acid through a neutral agent:

- Sodium bicarbonate (Alka-Seltzer)
- Calcium carbonate (TUMS)
- Aluminum Hydroxide
- Magnesium Hydroxide (Milk of Mag)

Or mix of multiple agents (Mylanta)

### USES

For **IMMEDIATE relief**

→ Work quickly
→ Not long lasting (body will produce more acid again)

### SIDE EFFECTS

**ALUMINUM + CALCIUM**

- Constipation

**MAGNESIUM**

- Diarrhea
- GI upset

### EDUCATION

★ **Do NOT mix with other meds** (can block absorption)
★ Take 1 hour before or after other meds
★ NOT for heart failure patients (contain Na)

## HISTAMINE 2 BLOCKERS

**SUFFIX: –TIDINE**

### ACTION

Block **histamine H2 receptors** in the stomach to reduce gastric secretions

- Famo**TIDINE** (Pepcid)
- Ran**TIDINE** (Zantac)
- Cime**TIDINE** (Tagamet)

### USES

Peak **30–60 MINUTES**

→ GERD
→ Duodenal and gastric ulcers

### SIDE EFFECTS

→ Diarrhea
→ GI upset
→ Headache
→ Decreased libido
→ B12 deficiency (long term use)

Reduced acid can lead to bacterial overgrowth & lead to **aspiration pneumonia**

### EDUCATION

★ Take 30 mins before meals
★ Don't overeat
★ Stress reduction
★ No smoking or NSAIDs
★ Take at night for ulcers

## PROTON PUMP INHIBITORS

**SUFFIX: –PRAZOLE**

### ACTION

Inhibits **proton pump in parietal cells** of the stomach to reduce gastric secretions

- Panto**PRAZOLE** (Protonix)
- Ome**PRAZOLE** (Prilosec)
- Esome**PRAZOLE** (Nexium)

### USES

Peak **30–60 MINUTES**
(Usually for short term use)

→ Heartburn
→ GERD
→ Gastritis
→ **Stress ulcer prophylaxis**

### SIDE EFFECTS

→ GI upset
→ C. diff
→ Osteoporosis & bone fractures (long term use)

Reduced acid can lead to bacterial overgrowth & lead to **aspiration pneumonia**

### EDUCATION

★ Take 30 mins before meals
★ **Regular bone density scans**
★ Monitor for signs of diarrhea or GI upset

## MUCOSAL PROTECTANT

**SUCRALFATE**

### ACTION

Reacts with stomach acid to form a thick paste that adheres to the ulcers

**SUCRALFATE COATS THE STOMACH**

### USES

→ Gastric & duodenal ulcers

### SIDE EFFECTS

→ Constipation

### EDUCATION

★ Take 1 hour before meals & at bedtime
★ Do not take with other meds

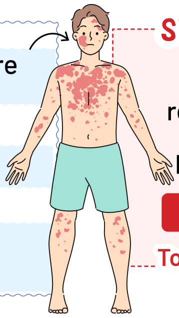
# ANTIBIOTICS

## CELL WALL INHIBITORS

Group of antibiotics that affect cell wall synthesis causing cell death; considered the most effective and extensively used class

### FOR ALL ANTIBIOTICS:

- **Always finish ABX course even if feeling better** (unless severe reaction & instructed otherwise by PCP)
- Always draw blood cultures BEFORE giving antibiotics
- **Assess for signs of superinfection** (additional infections)
- **Assess for signs of toxicity**
- **Assess for hypersensitivity reactions** (such as anaphylaxis, Steven-Johnson syndrome or red man syndrome)



### STEVEN-JOHNSON SYNDROME

Potentially life threatening skin reaction caused by administration of certain meds that leads to blistering & sloughing of the skin

**STOP MEDICATION IMMEDIATELY**

Toxic epidermal necrolysis has same patho but affects larger BSA

## PENICILLINS

PREFIX: -CILLIN

### ACTION

**Bactericidal:** target peptidoglycan to cause cell wall death

#### TYPES

- Basic: gram +
- Broad Spectrum: gram + & gram -
- Penicillinase Resistant: Staph Aureous
- Extended Spectrum: gram -

### USES

- → Respiratory infections
- → Meningitis
- → Otitis media
- → Endocarditis
- → Urinary tract infections
- → Syphillis
- → Gonorrhea

### SIDE EFFECTS

- → **Anaphylaxis**
- → **C. diff**
- → GI upset
- → Headaches
- → Nephrotoxicity
- → Thrombocytopenia
- → Steven-Johnson syndrome

### NURSING CONSIDERATIONS

- ⋆ Absorbs better on empty stomach (but may take with food for GI upset)
- ⋆ Avoid admin with citrus
- ⋆ Makes oral contraceptives ineffective (use other method)
- ⋆ Monitor Cr/BUN & coags

There is a cross sensitivity between **PENICILLINS & CEPHALOSPORINS**
**ALWAYS check for penicillin allergy!**

## CEPHALOSPORINS

PREFIX: CEF- & CEPH-

### ACTION

**Bactericidal:** target peptidoglycan to cause cell wall death (very similar structure to penicillins)

#### GENERATIONS

- 1st Gen: gram + only
- 2nd Gen: gram + and some gram -
- 3rd Gen: weak gram + and MORE gram -
- 4th Gen: + & - & pseudomonas
- 5th Gen: + & - & MRSA

### USES

- → Urinary tract infections
- → Skin infections
- → Osteomyelitis
- → Otitis media
- → Respiratory infections
- → Surgical site infection prophylaxis

### SIDE EFFECTS

- → **Anaphylaxis**
- → **C. diff**
- → GI upset
- → Headaches
- → Nephrotoxicity
- → Thrombocytopenia
- → Steven-Johnson syndrome

### NURSING CONSIDERATIONS

- ⋆ Make oral contraceptives ineffective (use other method)
- ⋆ Monitor Cr/BUN & coags
- ⋆ Do not use while breastfeeding
- ⋆ NO alcohol

## GLYCOPEPTIDES

VANCOMYCIN

### ACTION

**Bactericidal:** target peptidoglycan to cause cell wall death

**ONLY TREATS GRAM + BACTERIA**

**Also includes:**

- DalbaVANcin
- TelaVANcin

### USES

- → C. diff (oral)
- → Endocarditis
- → Respiratory infections
- → MRSA infections
  - ▸ Wounds
  - ▸ Skin infections
  - ▸ Bone infections

### SIDE EFFECTS

- → Ototoxicity
- → Nephrotoxicity
- → Red man syndrome
  - ▸ Red itchy rash when infused too quickly
- → GI upset
- → Thrombocytopenia

### NURSING CONSIDERATIONS

- ⋆ Monitor skin for red man syndrome (slow down infusion or give Benadryl)
- ⋆ Requires close monitoring of **trough levels** to avoid toxicity & sub-therapeutic dose (take before admin)

IMMUNE MEDS

# ANTIBIOTICS

## PROTEIN SYNTHESIS INHIBITORS

Group of antibiotics that affect protein synthesis which slows or stops cell replication & growth

## MACROLIDES

PREFIX: –MYCIN

### ACTION

**BacterioSTATIC:** Inhibit RNA protein synthesis to allow body's immune system to kill bacteria

**TARGETS GRAM + BACTERIA**

**Examples:**
- Azithro**MYCIN** (Zithromax)
- Erythro**MYCIN**

### USES

- Respiratory infections
- Otitis media
- Chlamydia
- Pelvic inflammatory infections
- Alternative if penicillin allergy present

### SIDE EFFECTS

- **Dysrhythmias**
- GI upset
- C. diff
- Ototoxicity
- Liver toxicity
- Steven-Johnson syndrome

### NURSING CONSIDERATIONS

- Absorbs better on empty stomach (but may take with food for GI upset)
- Avoid admin with citrus
- Monitor liver enzymes
- Monitor for palpitations or chest pain

## AMINOGLYCOSIDES

GENTAMICIN

### ACTION

**BacteriCIDAL:** target ribosomes to disrupt protein synthesis and kill bacteria

**TARGETS GRAM – BACTERIA**

**Also includes:**
- Amikacin
- Tobramycin

### USES

- Severe UTI's
- Septicemia
- Endocarditis
- Respiratory infections

**VERY EFFECTIVE BUT HIGHLY TOXIC!**

Think a**MIN**oglycosides are **MEAN** because they're so toxic!

### SIDE EFFECTS

- **Ototoxicity**
- **Nephrotoxicity**
- **Neurotoxicity**
- Vertigo
- Ataxia
- Muscle weakness
- GI upset

### NURSING CONSIDERATIONS

- Monitor renal & liver function
- Requires close monitoring of trough levels to avoid toxicity
- Contraindicated for myasthenia gravis or parkinson's (inhibits ACH)

## TETRACYCLINES

PREFIX: –CYCLINE

### ACTION

**BacterioSTATIC:** Inhibit RNA protein synthesis to allow body's immune system to kill bacteria

**TARGETS GRAM + & GRAM –**

**Examples:**
- Doxy**CYCLINE**
- Mino**CYCLINE**

### USES

**Broad spectrum used for wide range of bacterial infections such as:**

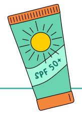
- Lyme's disease
- Acne
- STD's
- Respiratory infections
- UTI's

### SIDE EFFECTS

- **Tooth discoloration & delayed bone growth in children**
- **Photosensitivity**
- GI upset
- Hepatotoxicity

### NURSING CONSIDERATIONS

- Contraindicated in kids <8 or pregnant women
- Avoid foods high in calcium or iron (↓ absorption)
- Wear sunscreen & protect self from sun



## LINCOSAMIDES

CLINDAMYCIN

### ACTION

**BacterioSTATIC:** Inhibit RNA protein synthesis to allow body's immune system to kill bacteria

**TARGETS GRAM + BACTERIA**

Similar structure to **MACROLIDES**

### USES

- Toxic shock syndrome
- Septicemia
- Respiratory infections
- Necrotizing fasciitis
- Gangrene
- Pelvic inflammatory infections

### SIDE EFFECTS

- C. diff
- GI upset
- Dysrhythmias
- Thrombocytopenia
- Steven-Johnson syndrome

### NURSING CONSIDERATIONS

- Monitor bowel movements for diarrhea for bloody stool
- Monitor for palpitations or chest pain
- Monitor CBC & coags

# ANTIBIOTICS

## NUCLEIC ACID SYNTHESIS INHIBITORS

Group of antibiotics that prevent part of DNA synthesis
to slow or stop cell replication & growth

## SULFONAMIDES

**PREFIX: SULFA–**

### ACTION

**BacterioSTATIC:** Inhibit folic acid synthesis to allow body's immune system to kill bacteria

TARGETS GRAM + & GRAM –

Contraindicated if allergic to other sulfa drugs like thiazide & loop diuretics & oral hypoglycemics

### USES

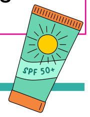
- → **Urinary tract infections (e.coli)**
- → Otitis media
- → Respiratory infections

### SIDE EFFECTS

- → **Crystalluria**
- → GI upset
- → Photosensitivity
- → Steven-Johnson syndrome
- → Hemolytic anemia
- → Photosensitivity

### NURSING CONSIDERATIONS

- ★ Assess for sulfa allergy
- ★ Encourage fluids (to prevent kidney stones from crystalluria)
- ★ Wear sunscreen & protect self from sun
- ★ Monitor CBC & coags



## FLUOROQUINOLONES

**SUFFIX: –FLOXACIN**

### ACTION

**BacteriCIDAL:** Target ribosomes to disrupt protein synthesis and kill bacteria

TARGETS GRAM + & GRAM –

**Examples:**

- ☛ Levo**FLOXACIN**
- ☛ Cipro**FLOXACIN**

### USES

- → Respiratory infections
- → Tuberculosis
- → Urinary tract infections
- → Pelvic inflammatory infections
- → Bone infections
- → Skin infections

### SIDE EFFECTS

- → **Tendon rupture**
- → GI upset
- → Photosensitivity
- → Headache
- → Aortic aneurysm
- → QT prolongation

### NURSING CONSIDERATIONS

- ★ Increased risk of toxicity in eldery
- ★ Contraindicated in pregnancy
- ★ Monitor for dysrhythmias
- ★ Wear sunscreen & protect self from sun

## METRONIDAZOLE

**ANTIPROTOZOAL**

### ACTION

**BacteriCIDAL:** Inhibits DNA and protein synthesis to cause cell death

TARGETS PROTOZOA & GRAM –

↳ (Metronidazole is unique upon the antiprotozoal class and targets protozoa AND some anaerobic bacteria )

### USES

**Treats protozoal & anaerobic bacterial infections:**

- → **C. diff**
- → Trichomonas
- → Giardia
- → Bacterial vaginosis

### SIDE EFFECTS

- → GI upset
- → Metallic taste
- → Dark urine
- → Steven-Johnson syndrome
- → Black box warning for cancer risk

### NURSING CONSIDERATIONS

- ★ **NO alcohol during or until 3 days after treatment** (will cause severe GI upset)
- ★ Monitor skin for signs of rash or peeling (SJS)
- ★ Metallic taste & dark urine are **normal** side effects (no need to report)

## NITROFURANS

**NITROFURANTOIN**

### ACTION

**Bactericidal:** Inhibits bacterial enzymes needed for protein synthesis, leading to cell death

TARGETS GRAM + & GRAM –

More specific to **urinary tract**

### USES

**Used for treatment of urinary tract infections caused by:**

- → E. coli
- → Enterococcus
- → Staphylococcus saprophyticus

### SIDE EFFECTS

- → Dark colored urine
- → GI upset
- → Headaches
- → Pulmonary toxicity
- → Steven-Johnson syndrome

### NURSING CONSIDERATIONS

- ★ Educate patient that discolored urine is a normal side effect
- ★ Monitor respiratory status
- ★ Monitor skin for signs of rash or peeling (SJS)

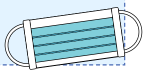
# IMMUNOSUPPRESSANTS

Meds that **suppress the immune system** to decrease symptoms in multiple autoimmune diseases

**Anytime the immune system is suppressed you want to implement:**

## NEUTROPENIC PRECAUTIONS

- Practice good hand hygiene
- NO live vaccines; inactivated only (flu shot okay!)
- Avoid large crowds and sick people
- Avoid fresh fruits and flowers
- Cook foods thoroughly



## NOTIFY PCP FOR:

- Elevated WBC
- Fever

NOT CRP; this is expected to be elevated in autoimmune patients due to **inflammation**

## METHOTREXATE

### ACTION

Inhibits folic acid synthesis to cause cell death of rapidly replicating cells

### USES

- Psoriasis
- Rheumatoid arthritis
- Cancers
- Nonviable ectopic pregnancies

### KEY INFO

- **BLEEDING PRECAUTIONS** (causes thrombocytopenia)
- No pregnancy until 3 months after treatment

## HYDROXYCHLOROQUINE

### ACTION

Inhibits replication of susceptible cells & reduces inflammation & fatigue

### USES

- Lupus
- Malaria
- Rheumatoid arthritis

### KEY INFO

- Takes several months to reach therapeutic level & see effects
- **Can cause retinal damage**; frequent eye exams needed (every 6 -12 months)

## CYCLOSPORINE

### ACTION

Suppresses immune system & disrupts inflammatory process to prevent disease progression

### USES

- Prevents organ rejection in transplant patients
- Inflammatory bowel disease
- Rheumatoid arthritis

### KEY INFO

- **Can cause gingival hyperplasia** (expected side effect)
- Contraindicated in pregnancy
- Requires lifelong administration

## TUMOR NECROSIS FACTOR INHIBITORS

- Inflixi**MAB**
- Adalimu**MAB**

### ACTION

Neutralizes biological role of tumor necrosis factors which lead to cytokine production & inflammation

### USES

- Inflammatory bowel disease
- Rheumatoid arthritis
- Psoriasis

### KEY INFO

- Contraindicated in patients with active infection
- Can reactivate tuberculosis (negative TB test needed before starting therapy)

PAIN MEDS

# NON-OPIOID ANALGESICS

Meds used for **mild to moderate pain** relief that do not have opioid effects

## NON-STEROIDAL ANTI-INFLAMMATORIES

### ACTION

Inhibits activities of COX-1 and COX-2 (enzymes responsible for synthesis of prostaglandins) which results in:

- Decreased inflammation
- Decreased pain
- Decreased temp

### EXAMPLES

- **Ibuprofen** (Advil)
- **Naproxen** (Aleve)
- **Ketoralac** (Toradol)
- **Celecoxib** (Celebrex)

### USES

- Mild-mod pain
- Fever
- Inflammatory diseases (Rheumatoid arthritis)

### SIDE EFFECTS

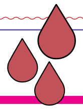
- Gastrointestinal ulcers
  - Nausea & vomiting
  - Anorexia
  - Diarrhea
  - Bloody stools
- Thrombosis
- Bronchospasm
- Kidney injury
- Worsening heart failure

### NURSING CONSIDERATIONS

- ★ Avoid taking on empty stomach
- ★ OKAY to take with antacids
- ★ Avoid drinking alcohol (↑ risk of ulcers)
- ★ Alert PCP immediately for bloody stool

**Contraindicated in:**

- Asthma
- CHF
- PUD
- Kidney disease
- Bleeding disorders
- GI bleed



## ASPIRIN

### ACTION

A type of NSAID that also contains antiplatelet properties

- Decreased inflammation
- Decreased pain
- Decreased temp
- **Decreased blood clotting**

**Also known as:**

- Ecotrin
- Acetylsalicylic acid

### USES

- Mild-mod pain
- Fever
- Prevention of MI & CVA
- Inflammatory diseases (Rheumatoid arthritis)

### SIDE EFFECTS

- Gastrointestinal ulcers
  - Nausea & vomiting
  - Anorexia
  - Diarrhea
  - Bloody stools
- Reyes Syndrome (in children)
- Tinnitus
- Rash

### NURSING CONSIDERATIONS

- ★ Avoid taking on empty stomach
- ★ Avoid drinking alcohol (↑ risk of ulcers)
- ★ Alert PCP immediately for bloody stool
- ★ Many OTC drugs contain ASA (read labels!)

**Contraindicated in:**

- Children with viral infection
- Bleeding disorders
- PUD or GI bleed

## ACETAMINOPHEN

### ACTION

Inhibits prostaglandin synthesis in the central nervous system leading to:

- Decreased pain
- Decreased temp

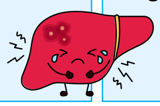
NO ANTI-INFLAMMATORY OR ANTICOAGULATION EFFECTS

**Also known as:**

- Tylenol
- Paracetamol

### USES

- Mild-mod pain
- Fever



### SIDE EFFECTS

- **Hepatotoxic if consumed in large doses**
  *(see Acute Liver Failure page in GI Bundle for more info)*
- GI upset

**Contraindicated in:**

- Liver disease
- Taking other hepatotoxic meds (Isoniazid)

### NURSING CONSIDERATIONS

- ★ **Max dose 4g/ day in healthy adults**
  - Many cold and flu OTC drugs also contain acetaminophen, so important to read labels!

**ANTIDOTE: N- ACETYLCYSTEINE**

- Can be given oral or as IV infusion (depending on severity)
- Close monitoring required (signs of acute liver failure)

PAIN MEDS

# OPIOID ANALGESICS

Meds used for **moderate to severe pain** relief that produce opioid and euphoric effects

## EXAMPLES

Morphine Sulfate
Hydromorphone
Codeine
Tramadol
Oxycodone
Fentanyl

## ACTION

Bind to receptors in the central and peripheral nervous system which leads to a decrease in pain perception

## BLACK BOX WARNING

- Respiratory depression
- Abuse & addiction

(See *Substance Abuse Disorders* in *Mental Health Bundle* for more info)

## USES

- Acute pain management
  - Trauma
  - Surgery
  - Burns
  - Sickle cell crisis
  - Pancreatitis
  - Dental pain
- Chronic pain management
  - Cancer
  - Fibromyalgia
  - Back pain
  - Neuropathy
- Palliative care
- Part of sedation regimen in mechanically ventilated patients

**DO NOT** decrease fever or inflammation

## ROUTES

### ORAL (PO)

Take longer to work; closely monitor patient's pain to avoid breakthrough pain

### IV PUSH

Given inpatient for fast pain relief (make sure to push SLOW & check vitals before and after)

### IV INFUSION

Given inpatient during surgery or in ICU while patient is sedated for adequate pain relief

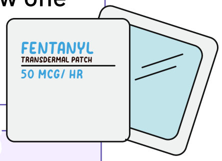
### PCA PUMP

Patient-controlled only; patient presses button to release dose (family/ visitors/ nurse CANNOT press button!)

### TRANSDERMAL PATCH

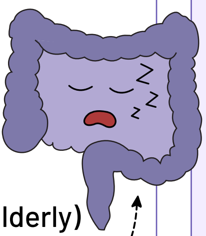
Used for chronic pain requiring around the clock pain management

- ALWAYS remove patch before applying new one
- ALWAYS time and date patch
- Rotate sites



## SIDE EFFECTS

- **Respiratory depression**
- **Hypotension**
- **Bradycardia**
- Drowsiness
- Dizziness
- Nausea/ vomiting
- Dry mouth
- Itching/ rash
- Confusion (especially in elderly)
- Constipation
  - Usually from prolonged use
  - Can lead to paralytic ileus



## NURSING INTERVENTIONS

- Monitor respiratory status
- Monitor HR & BP
- Monitor neuro status
- Reassess 15-30 mins after admin
- Fall precautions
- Encourage breathing exercises
- Give stool softener & ambulate to avoid constipation
- Educate patient to NOT take with alcohol

## SIGNS OF OVERDOSE

- Respirations <12
- Unarousable
- Hypoxia
- Cool & clammy skin
- Pinpoint pupils
- ↓ BP ↓ HR

## ANTIDOTE: NALOXONE (NARCAN)

- Rapidly reverses effects of opioids
- Given every 2-3 minutes until desired response

# MOOD STABILIZERS

Meds used for the treatment of **bipolar disorder**

NOTE: **Lithium** is the only true mood stabilizer, while the other three meds are in the class of **anticonvulsants**

## LITHIUM

CLASS: MOOD STABILIZER

### ACTION

**NOT FULLY UNDERSTOOD**

Thought to involve ion regulation, neurotransmitter modulation & impact messenger systems

**THERAPEUTIC LEVEL**
0.6-1.2 meq/ L

### USES

- **Bipolar disorder**
  Effective in controlling manic phase

### SIDE EFFECTS

- Weight gain
- Dry mouth
- Drowsiness

**SIGNS OF TOXICITY**

- Nausea
- Vomiting
- Anorexia
- Confusion
- Ataxia
- Seizures
- Tremors
- Sedation

**CAUSED BY:**

- Fluid loss
- Hyponatremia
- Decreased renal function

### NURSING CONSIDERATIONS

- Contraindicated in pregnancy (teratogenic)
- Ensure adequate Na & fluid intake
- Monitor Cr & BUN
- Check lithium levels every 2 months

## VALPROIC ACID

CLASS: ANTICONVULSANT

### ACTION

Increases gamma-aminobutyric acid (GABA) in the brain

**THERAPEUTIC LEVEL**
50-100 mcg/ml

### USES

- Simple & complex seizures
- Bipolar disorder
- Migraine prophylaxis

### SIDE EFFECTS

- Nausea/ vomiting
- Drowsiness
- Dizziness
- Tremors
- Thrombocytopenia
- Anemia
- Elevated liver enzymes
- Weight gain

**SIGNS OF TOXICITY**

- Confusion
- Coma
- Liver failure
- Seizures

### NURSING CONSIDERATIONS

- **Assess baseline LFT & monitor levels**
- **Monitor for signs of bleeding & CBC**
- DO NOT discontinue abruptly
- Avoid use during pregnancy (can cause congenital defects)

## CARBAMAZEPINE

CLASS: ANTICONVULSANT

### ACTION

Blocks sodium channels to prevent and stabilize rapid firing of neurons

**RISK FOR ↓ BLOOD OSMOLARITY**
Can cause water retention leading to **SIADH**

### USES

- Bipolar disorder
- Trigeminal neuralgia
- Tonic-clonic & partial seizures

### SIDE EFFECTS

- Agranulocytosis
  - Risk of infection
- Thrombocytopenia
- Anemia
- Steven-Johnson syndrome
- Water retention

### NURSING CONSIDERATIONS

- Decreases efficacy of oral contraceptives (use other methods)
- Avoid grapefruit juice (increases serum levels)
- Monitor CBC & electrolyte levels
- Monitor for infection

## LAMOTRIGINE

CLASS: ANTICONVULSANT

### ACTION

Blocks sodium channels to prevent and stabilize rapid firing of neurons

**RISK FOR SUIDICAL THOUGHTS**
Monitor for any signs of depression or suicidal ideation

### USES

- Bipolar disorder
- Tonic-clonic & partial seizures

### SIDE EFFECTS

- **Steven-Johnson syndrome**
- **Aseptic meningitis**
- **Suicidal thoughts**
- GI upset
- Photosensitivity
- Dizziness

### NURSING CONSIDERATIONS

- Monitor for signs of rash
- Valproic acid can DOUBLE the serum level of lamotrigine (usually prescribed at lower dose)
- Monitor for signs of worsening depression

PSYCH MEDS

# ANTIDEPRESSANTS

### EDUCATION

- ★ Take a few weeks for full effect
- ★ NEVER stop abruptly

### INCREASED RISK OF SUICIDE

Especially in the **first few weeks of taking**; notify PCP for any signs of mood changes, unusual behavior, or new thoughts of suicide

### SEROTONIN SYNDROME

Potentially life-threatening disorder due to ↑ serotonin levels

- ▸ Hyperthermia
- ▸ Agitation
- ▸ Hallucinations
- ▸ Muscle rigidity
- ▸ Tremors
- ▸ Hyperreflexia

CAN LEAD TO COMA OR SEIZURES

## SSRIs

SELECTIVE SEROTONIN REUPTAKE INHIBITORS

- Escitalo**PRAM**
- Flu**OXETINE**

### ACTION

Blocks reuptake of serotonin into neurons causing increased serotonin levels in the brain

### USES

- → Depressive disorders
- → Anxiety disorders
- → Post-traumatic stress disorder

### SIDE EFFECTS

- → Weight gain
- → GI upset
- → **Insomnia**
- → **Sexual dysfunction**
- → **Suicidal thoughts**

### NURSING CONSIDERATIONS

- ★ Do NOT take with St. John's wort or MAOI's or tramadol (can cause serotonin syndrome)
- ★ Monitor for signs and symptoms of SEROTONIN SYNDROME

## SNRIs

SEROTONIN NOREPINEPHRINE REUPTAKE INHIBITORS

- Duloxetine
- Venlafaxine

### ACTION

Blocks reuptake of serotonin & norepinephrine causing increased serotonin levels in the brain

### USES

- → Depressive disorders
- → Anxiety disorders
- → Fibromyalgia

### SIDE EFFECTS

- → Weight gain
- → GI upset
- → **Insomnia**
- → **Sexual dysfunction**
- → **Suicidal thoughts**

### NURSING CONSIDERATIONS

- ★ Do NOT take with St. John's wort or MAOI's or tramadol (can cause serotonin syndrome)
- ★ Monitor for signs and symptoms of SEROTONIN SYNDROME

## MAOIs

MONOAMINE OXIDASE INHIBITORS

- Phenelzine
- Tranylcypromine

### ACTION

Blocks monoamine oxidase which increases dopamine, epinephrine, norepinephrine & serotonin

### USES

- → Depressive disorders
- → Anxiety disorders
- → Social phobias

### SIDE EFFECTS

- → **Hypertensive crisis**
- → **Suicidal thoughts**
- → Agitation/ anxiety
- → Orthostatic hypotension
- → Anticholinergic effects (constipation, dry mouth, blurred vision)

### NURSING CONSIDERATIONS

- ★ Interacts with MANY OTC meds (check with PCP)
- ★ **Avoid tyramine rich foods** (can cause HTN crisis)
- ★ NOT for use with other antidepressants (can cause SEROTONIN SYNDROME)

### FOODS TO AVOID

- ▸ Red wine
- ▸ Chocolate
- ▸ Aged cheese
- ▸ Fermented foods

## TCAs

TRICYCLIC ANTIDEPRESSANTS

- Ami**TRIPTYLINE**
- Clomi**PRAMINE**

### ACTION

Blocks reuptake of serotonin & norepinephrine causing increased serotonin levels in the brain

### USES

- → Depressive disorders
- → Neuropathic pain
- → Insomnia

### SIDE EFFECTS

- → Sedation
- → Dysrhythmias
- → Orthostatic hypotension
- → Photosensitivty
- → Anticholinergic effects (constipation, dry mouth, blurred vision)

### NURSING CONSIDERATIONS

- ★ Protect self from sun & always wear sunscreen
- ★ Best given at bedtime due to sedating effects
- ★ FALL RISK (due to sedation)
- ★ Monitor for dysrhythmias

# ANXIOLYTICS

Meds used for the treatment of **anxiety disorders** and in some situations for sedative effects

### SIGNS OF OVERDOSE IN BENZOS & BARBITURATES

- Respiratory depression
- Excessive drowsiness
- Slurred speech
- Confusion
- Loss of coordination
- Hypotension
- Bradycardia
- Coma

### ABC'S ARE PRIORITY

In any pharm question you get asked about benzos or barbiturates, **AIRWAY, BREATHING & CIRCULATION** ALWAYS take priority over anything else!

## BENZODIAZEPINES

**SUFFIX: –LAM & –PAM**

- Lorazepam → Lorazе**PAM**
- Alprazo**LAM**
- Diaze**PAM**

### ACTION

Increases GABA in the brain which decreases neuron activity

**CAUSES SEDATION**
Important to monitor ABC's!

**CAN LEAD TO DEPENDENCE**
For short term use only

### USES

**QUICK ONSET**

- Acute anxiety
- Alcohol withdrawal
- Acute seizures
- Pre-procedure

### SIDE EFFECTS

- Sedation
- Hypotension
- Bradycardia
- Bradypnea
- Amnesia

**Not** recommended in use of elderly due to history of poor tolerance

### NURSING CONSIDERATIONS

- Monitor respiratory status closely
- Monitor VS & ECG
- Do not abruptly stop
- Fall precautions

**ANTIDOTE: FLUMAZENIL**

## BARBITURATES

**SUFFIX: –BARBITAL**

- Pheno**BARBITAL**
- Pento**BARBITAL**

### ACTION

Increases GABA in the brain which decreases neuron activity

**CAUSES SEDATION**
Important to monitor ABC's!

**LONGER HALF LIFE**
Takes longer to leave body which causes increased risk of toxicity

### USES

- Acute seizures
- Pre-procedure
- Sedation

### SIDE EFFECTS

- Sedation
- Dizziness
- Confusion
- ↓ BP ↓ HR ↓ RR
- Ataxia
- Dependence (not for long term use)

### NURSING CONSIDERATIONS

- Monitor VS & respiratory status closely
- Keep emergency intubation kit at bedside
- Monitor serum levels!

**NO ANTIDOTE!**

**THERAPEUTIC RANGE**
15-40 mcg/ml

## BUSPIRONE

**CLASS: AZAPIRONES**

### ACTION

Binds to serotonin and dopamine receptors to decrease anxiety

**NO SEDATIVE EFFECTS**
No risk of respiratory depression

**NOT FOR ACUTE TREATMENT**
Takes about **2 weeks** to work and not effective for acute symptoms

### USES

**LONG ONSET**

- Generalized anxiety disorder
- OCD
- PTSD

### SIDE EFFECTS

- Dizziness
- Headache
- Nausea
- Restlessness
- Nervousness

### NURSING CONSIDERATIONS

- Do NOT take if taking MAOI's
- Do NOT take with grapefruit juice
- Take consistently with or without food to prevent change in absorption

PSYCH MEDS

# ANTIPSYCHOTICS

Meds that are used to treat common symptoms in **psychosis-related disorders**

## TYPICALS

### AKA 1ST GENERATION

**SUFFIX:**

-PERIDOL & -AZINE

**EXAMPLES:**

- **HaloPERIDOL** (Haldol)
- **DroPERIDOL** (Inapsine)
- **ChlorpromAZINE** (Thorazine)
- **FluphenAZINE** (Prolixin)

### ACTION

Block **dopamine receptors** in the brain

**FUNCTION OF DOPAMINE**

- ⋆ Movement & motor control
- ⋆ Reward & motivation
- ⋆ Mood regulation
- ⋆ Memory & attention

HALDOL
5 MG/ ML

### USES

- → Targets **POSITIVE** symptoms in schizophrenia (hallucinations, delusions, thought disorders)
- → Acute agitation
- → Tourette syndrome

### SIDE EFFECTS

- → Anticholinergic effects (blurred vision, urinary retention, constipation, dry mouth)
- → Agranulocytosis (risk for infection)
- → **Dysrhythmias (causes QT prolongation)**
- → Sedation
- → Orthostatic hypotension

NORMAL

**EXTRAPYRAMIDAL SYMPTOMS (EPS)**

- ▸ Dystonia (involuntary muscle contractions)
- ▸ Pseudoparkinsonism (shuffling gait, bradykinesia, tremors, rigidity)
- ▸ Akathisia (restlessness)
- ▸ Tardive Dyskinesia (involuntary movements of mouth, face & neck)

**usually with long term use**

**TREATED WITH BENZTROPINE**

**NEUROLEPTIC MALIGNANT SYNDROME** ⚠

Life-threatening condition from the use or withdrawal of dopamine agonists

- ▸ High fever & diaphoresis
- ▸ Altered mental status
- ▸ Muscle rigidity
- ▸ Tremors

**IMMEDIATELY NOTIFY HCP & HOLD MED**

## ATYPICALS

### AKA 2ND GENERATION

**SUFFIX:**

-PINE & -DONE

**EXAMPLES:**

- **ClozaPINE** (Clozaril)
- **OlanzaPINE** (Zyprexa)
- **RisperiDONE** (Risperdal)
- **ZiprasiDONE** (Geodon)

### ACTION

Block **dopamine AND serotonin receptors** in the brain

**FUNCTION OF SEROTONIN**

- ⋆ "Happiness hormone"
- ⋆ Sleep-wake cycle
- ⋆ Mood regulation
- ⋆ Pain perception

### USES

- → Targets **positive AND negative symptoms in schizophrenia**
- → Acute psychosis or agitation
- → Schizoaffective disorder

### SIDE-EFFECTS

**Lower risk for extrapyramidal symptoms & neuroleptic malignant syndrome**
**(but still need to monitor)**

- → Metabolic syndrome
  - ▸ Weight gain
  - ▸ Diabetes
  - ▸ Hypercholesterolemia
- → **QT prolongation (ziprasidone)**
- → Headaches
- → Seizures
- → Hypersalivation/ drooling
- → Sedation (decreases over time with tolerance)
- → Agranulocytosis (risk for infection)
- → Orthostatic hypotension
- → Decreased libido
- → Anticholinergic effects (blurred vision, urinary retention, constipation, dry mouth)

**BLACK BOX WARNING**

**CONTRAINDICATED IN DEMENTIA PATIENTS**

The use of atypical antipsychotics has been shown to increase mortality rates in patients with dementia (always question if ordered)

# TYPES OF INSULIN

## RAPID ACTING

| GENERIC | TRADE |
|---|---|
| Glulisine | Apidra |
| Lispro | Huma**LOG** |
| Aspart | Novo**LOG** |

Think of a **LOG** rolling **RAPIDLY** down a hill

**ONSET:** 15 mins
**PEAK:** 30-90 mins
**DURATION:** 3-5 hours

**KEY INFO**

- Timed with meals
- Highest risk of **HYPOGLYCEMIA**

## SHORT ACTING

| GENERIC | TRADE |
|---|---|
| Regular | Huma**LIN R**<br>Novo**LIN R** |

**ONSET:** 30-60 mins
**PEAK:** 2-4 hours
**DURATION:** 5-8 hours

**KEY INFO**

- Timed with meals
- Only type that can be given IV
- Can be mixed with NPH

## INTERMEDIATE ACTING

| GENERIC | TRADE |
|---|---|
| NPH | Huma**LIN N**<br>Novo**LIN N** |

**ONSET:** 60-120 mins
**PEAK:** 4-12 hours
**DURATION:** 14 hours

**KEY INFO**

- Given twice per day (not timed with meals)
- Can be mixed with regular insulin

## LONG ACTING

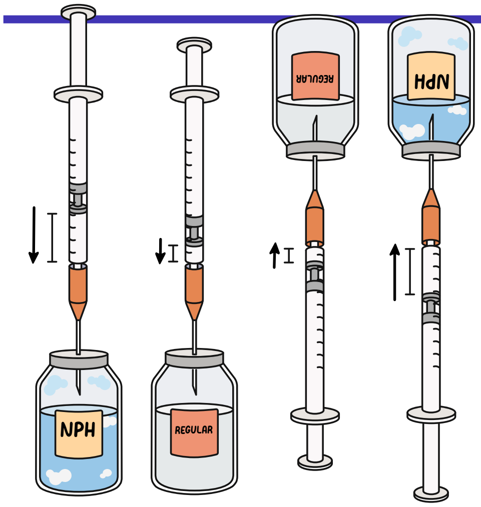
| GENERIC | TRADE |
|---|---|
| Glargine | Lantus |
| Detemir | Levemir |

**ONSET:** 60-120 mins
**PEAK:** NONE
**DURATION:** 24 hours

**KEY INFO**

- Given 1-2 times per day (not timed with meals)
- Can never be mixed

## MIXING INSULIN



**EXAMPLE ORDER:** Give 10 units NPH & 8 units regular insulin (equals a total of 18 units between both insulins)

① Check order to verify dose of each insulin
② Roll "CLOUDY" (NPH) between hands to mix; do NOT shake
③ Clean tops of both insulin vials with alcohol
④ Inject 10 units of **AIR** into NPH & remove syringe
⑤ Inject 8 units of **AIR** into REGULAR INSULIN & then turn vial upside down & draw up 8 units **INSULIN** & remove syringe
⑥ Insert syringe into NPH & turn upside down & draw up 10 units **INSULIN**; plunger should be pulled to 18

# TEMPLATES & PLANNERS

**DISEASE NAME:**

## WHAT IS IT?

## PATHO

## RISK FACTORS/ CAUSES

## SIGNS & SYMPTOMS

## COMPLICATIONS

## DIAGNOSTICS/ LABS

## TREATMENT

## NURSING INTERVENTIONS

## PATIENT/ FAMILY EDUCATION

**DISEASE NAME:**

**WHAT IS IT?**

**PATHO**

**RISK FACTORS/ CAUSES**

**SIGNS & SYMPTOMS**

**COMPLICATIONS**

**DIAGNOSTICS/ LABS**

**TREATMENT**

**NURSING INTERVENTIONS**

**PATIENT/ FAMILY EDUCATION**

**PATHOPHYSIOLOGY**

**RISK FACTORS/ CAUSES**

**SIGNS & SYMPTOMS**

**DIAGNOSTICS/ LABS**

**DISEASE NAME**

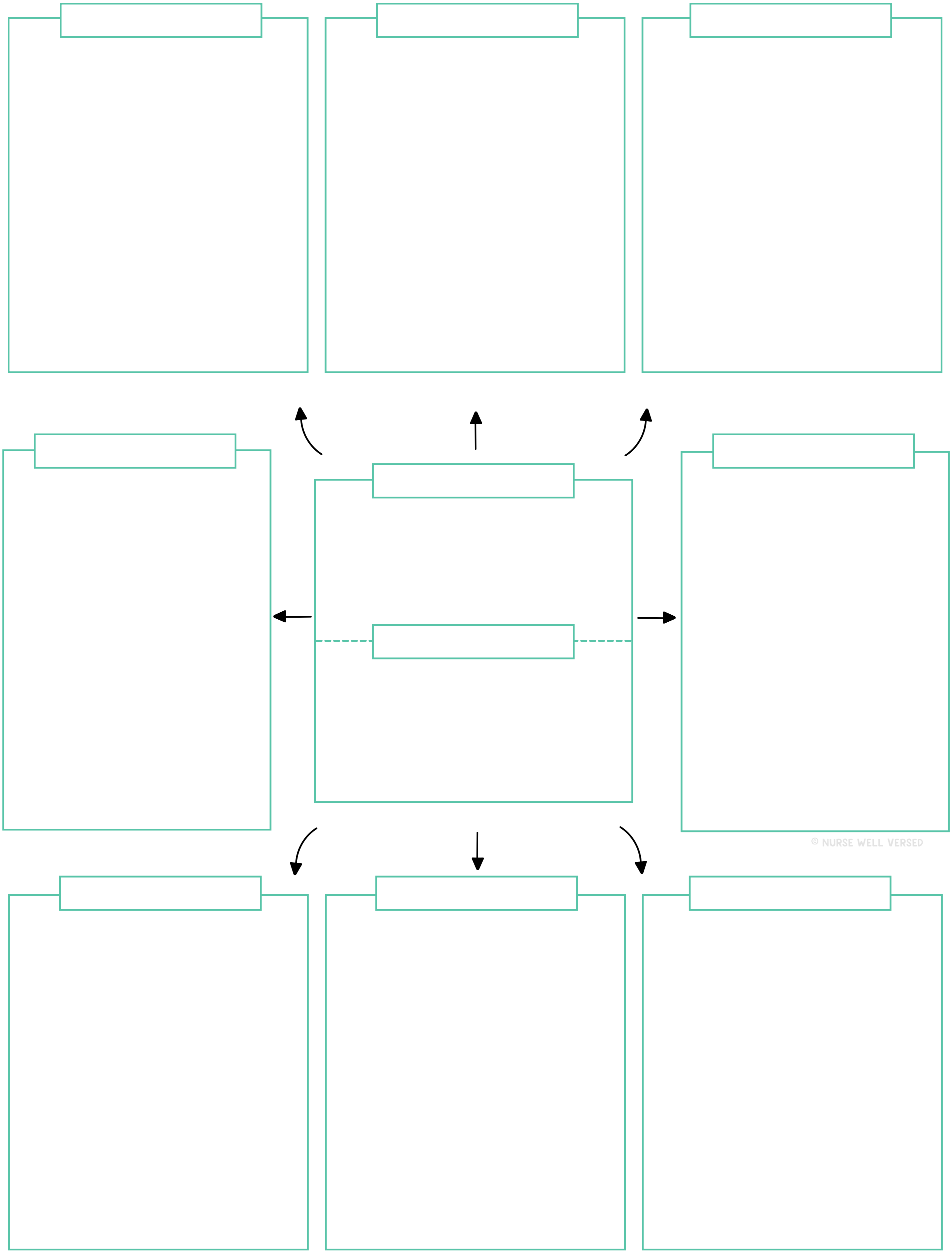
**WHAT IS IT?**

**COMPLICATIONS**

**TREATMENT**

**NURSING INTERVENTIONS**

**PATIENT/ FAMILY EDUCATION**



**PATHOPHYSIOLOGY**

**RISK FACTORS/ CAUSES**

**SIGNS & SYMPTOMS**

**DIAGNOSTICS/ LABS**

**DISEASE NAME**

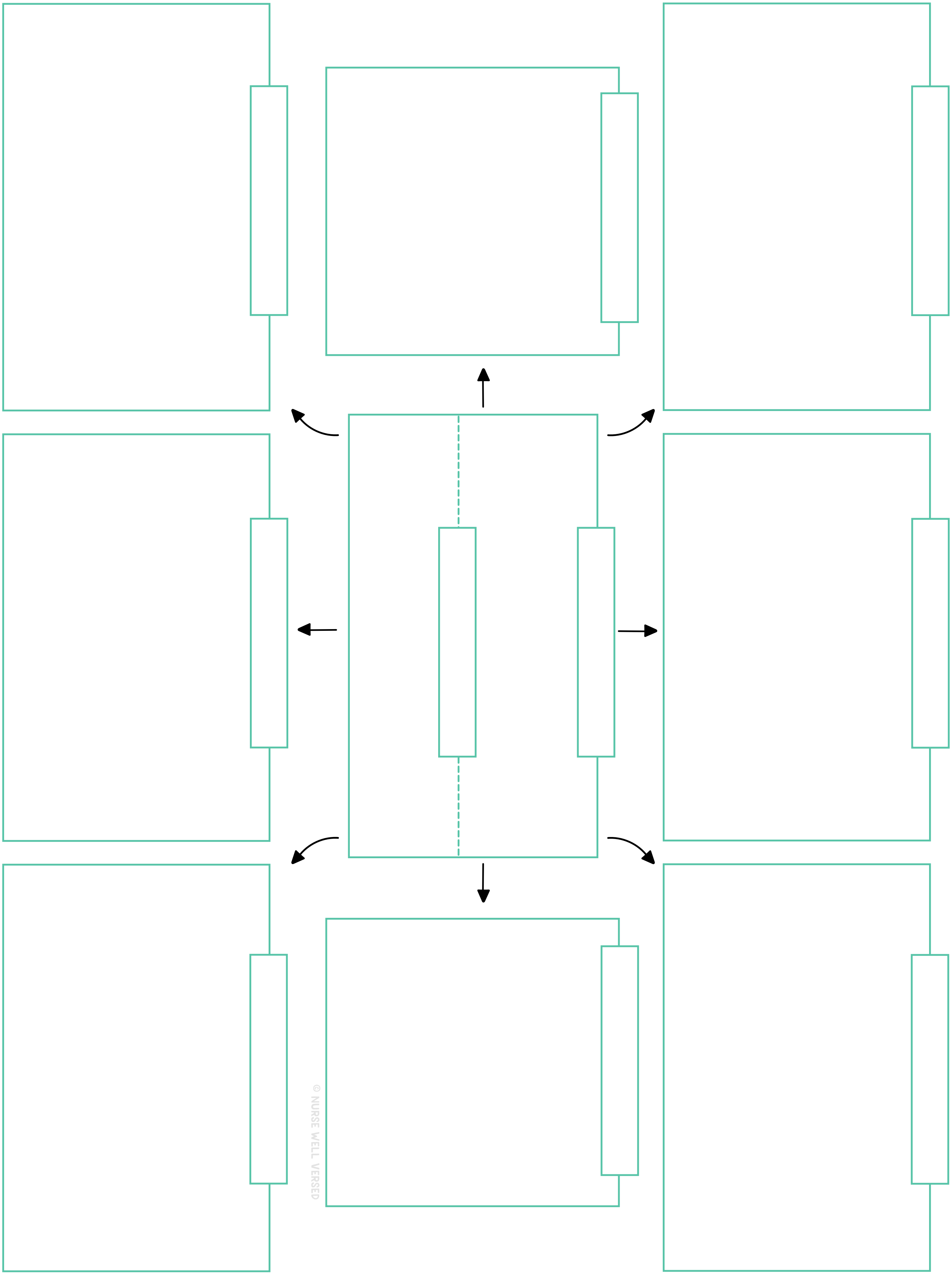
**WHAT IS IT?**

**COMPLICATIONS**

**TREATMENT**

**NURSING INTERVENTIONS**

**PATIENT/ FAMILY EDUCATION**



**DRUG CLASS:**

| GENERIC NAME(S) | TRADE NAME(S) |
|---|---|
| | |

**SUFFIX/ PREFIX:**

## MECHANISM OF ACTION

## THERAPEUTIC USES

## SIDE EFFECTS

## CONTRAINDICATIONS

## NURSING CONSIDERATIONS

## PATIENT EDUCATION

## NOTES

**DRUG CLASS:**

**GENERIC NAME:**

**TRADE NAME:**

**SUFFIX/ PREFIX**

**MECHANISM OF ACTION**

**SIDE EFFECTS**

**USES**

**NURSING CONSIDERATIONS**

**GENERIC NAME:**

**TRADE NAME:**

**SUFFIX/ PREFIX**

**MECHANISM OF ACTION**

**SIDE EFFECTS**

**USES**

**NURSING CONSIDERATIONS**

**GENERIC NAME:**

**TRADE NAME:**

**SUFFIX/ PREFIX**

**MECHANISM OF ACTION**

**SIDE EFFECTS**

**USES**

**NURSING CONSIDERATIONS**

**GENERIC NAME:**

**TRADE NAME:**

**SUFFIX/ PREFIX**

**MECHANISM OF ACTION**

**SIDE EFFECTS**

**USES**

**NURSING CONSIDERATIONS**

# Nursing CARE PLAN

DATE:

PATIENT ROOM #:

## ASSESSMENT

| OBJECTIVE | SUBJECTIVE |
|---|---|
| | |

## DIAGNOSIS

| PROBLEM (S) | ETIOLOGY (AEB) | SIGNS & SYMPTOMS |
|---|---|---|
| | | |

## PLANNING

REMEMBER TO SET
**SMART** GOALS

**S**PECIFIC
**M**EASUREABLE
**A**TTAINABLE
**R**ELEVANT
**T**IMELY

| SHORT TERM GOALS | LONG TERM GOALS |
|---|---|
| | |

## IMPLEMENTATION

| NURSING INTERVENTIONS |
|---|
| |

## EVALUATION

| OUTCOME (S) | AS EVIDENCED BY: |
|---|---|
| | |

① → ② → ③

**ROOM/ BED #**

Patient name:
Age:
Code status:
Admit date:
Living situation:
Isolation/ Precautions:
Allergies:

## PAST MEDICAL HISTORY

## REASON PATIENT CAME IN

④

## NEURO

**AAOx:**
**GCS:**
**Safety:** Sitter/ Restraints
**NIH:**
**Neuro checks:**

**NOTES/ UPDATES**

⑤

## CARDIAC

**Rhythm:**
**Tele:**
**Edema:**
**Daily Weight:** Yes/ No
**Last Weight:**

**NOTES/ UPDATES**

⑥

## RESPIRATORY

**02 requirements:**
**ETT/ Trach:**
**Settings:**
**Lung sounds:**

**NOTES/ UPDATES**

⑦

## GI

**Diet:**
**NG/ OG:**
**Blood sugar checks:**
**Last BM:**

**NOTES/ UPDATES**

⑧

## GU

**Continent/ incontinent/ foley**
**Foley insertion date:**
**Urine output:**
**Last voided:**

**NOTES/ UPDATES**

⑨

## SKIN

**WOUND #1**
Location: Type: Dressing:

**WOUND #2**
Location: Type: Dressing:

⑩

## VTE

SCD's / Heparin / Lovenox / Coumadin / Xarelto / Eliquis

⑪

## PAIN

Location: Medication: Last given:

⑫

## IV SITES/ CENTRAL LINES

| | |
|---|---|
| **Site #1:** | **Date Inserted:** |
| **Site #2:** | **Date Inserted:** |
| **Site #3:** | **Date Inserted:** |
| **Site #4:** | **Date Inserted:** |

⑬

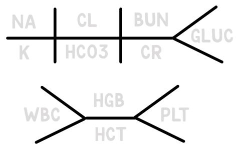
## DRIPS/ INFUSIONS

**Med/ Fluid:** @
**Med/ Fluid:** @
**Med/ Fluid:** @
**Med/ Fluid:** @

⑭

## LABS/ TESTS

(Circle abnormal labs )



**DIAGNOSTIC TESTS:**

⑮

## PENDING

| | |
|---|---|
| **Labs** | **Tests** |
| **Consults** | **Nursing Care** |

## NOTES

# NCLEX

## 4 WEEK STUDY PLAN

**NCLEX EXAM DATE:**

you got this!

### STUDY TIPS

- Plan a rest day each week! Rest is vital to retaining information
- Prioritize your weak areas (think what subjects did you get the lowest grades)
- Do practice questions EVERY DAY and read the rationales!
- Keep track of practice q scores and review info on subjects that you missed

| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
|---|---|---|---|---|---|---|
| SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: |
| SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: |
| SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: |
| SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: |

# NCLEX

## 5 WEEK STUDY PLAN

**NCLEX EXAM DATE:**

*you got this!*

### STUDY TIPS

- Plan a rest day each week! Rest is vital to retaining information
- Prioritize your weak areas (think what subjects did you get the lowest grades)
- Do practice questions EVERY DAY and read the rationales!
- Keep track of practice q scores and review info on subjects that you missed

| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
|---|---|---|---|---|---|---|
| SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: |
| SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: |
| SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: |
| SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: |
| SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: |

# NCLEX

## 6 WEEK STUDY PLAN

**NCLEX EXAM DATE:**

*you got this!*

### STUDY TIPS

- Plan a rest day each week! Rest is vital to retaining information
- Prioritize your weak areas (think what subjects did you get the lowest grades)
- Do practice questions EVERY DAY and read the rationales!
- Keep track of practice q scores and review info on subjects that you missed

| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
|---|---|---|---|---|---|---|
| SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: |
| SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: |
| SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: |
| SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: |
| SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: |
| SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: | SUBJECTS:<br># of Q's: |

# Monthly PLANNER

MONTH & YEAR:

| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

## TOP PRIORITIES THIS MONTH

①
②
③
④
⑤

## NOTES

# Weekly PLANNER

## SUNDAY

## MONDAY

## TUESDAY

## WEDNESDAY

## THURSDAY

## FRIDAY

## SATURDAY

## TOP PRIORITIES THIS WEEK

①

②

③

## TO DO

☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐

## ASSIGNMENT/ EXAM DATES

## NOTES

# Daily PLANNER

DATE:

| | |
|---|---|
| 12:00 AM | |
| 01:00 AM | |
| 02:00 AM | |
| 03:00 AM | |
| 04:00 AM | |
| 05:00 AM | |
| 06:00 AM | |
| 07:00 AM | |
| 08:00 AM | |
| 09:00 AM | |
| 10:00 AM | |
| 11:00 AM | |
| 12:00 PM | |
| 01:00 PM | |
| 02:00 PM | |
| 03:00 PM | |
| 04:00 PM | |
| 05:00 PM | |
| 06:00 PM | |
| 07:00 PM | |
| 08:00 PM | |
| 09:00 PM | |
| 10:00 PM | |
| 11:00 PM | |

## TOP PRIORITIES TODAY

①

②

③

## TO DO

☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐ 
☐

## NOTES

# Class SCHEDULE

**SEMESTER:**

| | SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
|---|---|---|---|---|---|---|---|
| 06:00 AM | | | | | | | |
| 07:00 AM | | | | | | | |
| 08:00 AM | | | | | | | |
| 09:00 AM | | | | | | | |
| 10:00 AM | | | | | | | |
| 11:00 AM | | | | | | | |
| 12:00 AM | | | | | | | |
| 01:00 PM | | | | | | | |
| 02:00 PM | | | | | | | |
| 03:00 PM | | | | | | | |
| 04:00 PM | | | | | | | |
| 05:00 PM | | | | | | | |
| 06:00 PM | | | | | | | |
| 07:00 PM | | | | | | | |
| 08:00 PM | | | | | | | |
| 09:00 PM | | | | | | | |
| 10:00 PM | | | | | | | |

## NOTES

## COURSES THIS SEMESTER:

①

②

③

④

⑤

# Grade TRACKER

**SEMESTER:**

**CLASS:**

**FINAL GRADE:**

| ASSIGNMENT/ PROJECT/ EXAM | DUE DATE | SUBMITTED | GRADE | % OF FINAL GRADE |
|---|---|---|---|---|
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |

**SEMESTER:**

# *Grade* TRACKER

**CLASS:** **FINAL GRADE:**

| ASSIGNMENT/ PROJECT/ EXAM | DUE DATE | SUBMITTED | GRADE | % OF FINAL GRADE |
|---|---|---|---|---|
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |

**CLASS:** **FINAL GRADE:**

| ASSIGNMENT/ PROJECT/ EXAM | DUE DATE | SUBMITTED | GRADE | % OF FINAL GRADE |
|---|---|---|---|---|
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |

**CLASS:** **FINAL GRADE:**

| ASSIGNMENT/ PROJECT/ EXAM | DUE DATE | SUBMITTED | GRADE | % OF FINAL GRADE |
|---|---|---|---|---|
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |
| | | ○ | | |